THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. DECEMBER 3, 1896. CHICAGO, ILL. NUMBER 49.

Moore's Anti-Friction

DIFFERENTIAL

CHAIN HOIST.

Adjustable Automatic Brake.
Self sustaining at every point.
Highest Efficiency
A New Movement.
A Perpetual Compound Lever.
Powerful, Simple and Durable.
Light, Compact and Strong.

NINE SIZES.

Half Ton to Ten Tons Capacity.

ALSO

HAND POWER CRANES, WINCHES, &c.

Moore Manufacturing Co.,

MILWAUKEE, WIS.

FORSTER, WATERBURY & CO., 636-638 THE ROOKERY, CHICAGO.

PIG IRON AND COKE.

Agents for
Iroquois, Peerless, Sterling Scotch, Northern and Southern Charcoal Iron.

MALLEABLE BESSEMER.

"THE IRON TRADE REVIEW"

is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

DICKMAN & MACKENZIE,

CLEVELAND, 71 Atwater Bldg. CHICAGO, 1224 Rookery Bldg

Mining properties examined. Ores sampled at mines, furnaces and all lake ports.
General analyses of Ores, Slags, Metals, Fuel Foundry Materials and Products, etc.

CHEMISTS AND ENGINEERS

GREY IRON CASTINGS,

Light and Medium weight,

FINE QUALITY.

The Taylor & Boggis Foundry Co.,

CLEVELAND O.

"CAHALL" VERTICAL WATER TUBE BOILERS MANUFACTURED BY THE AULTMAN & TAYLOR MACHINERY CO. MANSFIELD — OHIO "BABCOCK & WILCOX" HORIZONTAL

SEND FOR CATALOGUE.

CAHALL SALES DEPARTMENT,

Bank of Commerce Building, PITTSBURG, PA.
145 Taylor Building, New York City, N. Y.
The "Rookery," Chicago, Ill.
71 Perin Building, Cincinnati, O.
10 Peninsular Bank Bldg., Detroit, Mich.
24 South Water St., Cleveland, O.
712 Union St., New Orleans, La.
542 Drexel Bldg., Philadelphia, Pa.
1015 Tremont Bldg, Boston.

CASTINGS FROM 1 OZ. TO 60,000 Lbs.

For Rolling Mills, Blast Furnaces, Etc.

GET OUR PRICES.

THE RIPPEL MANUFACTURING CO.

FOUNDRY AND MACHINE WORKS, MT. GILEAD, O.

BUFFALO VENTILATING FANS

ELECTRIC, STEAM AND PULLEY TYPES. GREATEST AIR VOLUME, LEAST POWER

BUFFALO FORGE CO. BUFFALO, N.Y. U.S.A.

POWER TRANSMISSION

W.A. JONES FOUNDRY & MACHINE CO.

53-59 So. JEFFERSON ST. CHICAGO

TURNBUCKLES.

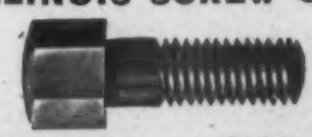
Cleveland City Forge & Iron Co.,

CLEVELAND, O.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

ILLINOIS SCREW CO.,



40 S. Canal st., Chicago.

ROLLS

INGOT MOLDS.

IRON CASTINGS

Light and Heavy.

ALSO

BRASS AND COPPER CASTINGS.

Write for Estimates.

THE LORAIN FOUNDRY CO.,

LORAIN, OHIO.

J. M ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 32 Wilshire Bldg., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 Wilshire Bldg., Cleveland, O.

J. E. WOLCOTT, Special Agent, 96 4th Avenue, Pittsburgh Pa.

Sheet Metal Working Machinery.

Compound Lever Sheet Iron Shears, all sizes. Seven different styleSquaring Shears and Punches, Crimping, Forming and Straightening Rolls, etc.

Berstch & Co., Cambridge City, Ind

THE UPSON NUT CO., Cleveland, O.,

MANUFACTURERS OF

MACHINE AND CARRIAGE BOLTS, HOT FORGED AND COLD PUNCHED NUTS, LAG SCREWS, BOLT ENDS, WASHERS, ETC. Catalogue and Prices on Application.

IT PAYS to obtain prices of **WM. B. POLLOCK & CO.** Youngstown, Ohio. Blast Furnaces, Steel Plants, Boilers, Tanks, etc.

410 Penn Ave., Pittsburg, Pa. Long Distance Telephone, No. 1599.

FESSENDEN & RIDINGER,
Consulting Electrical Engineers and Electro-Chemists.

THE 1896 EDITION
OF THE
Iron and Steel Directory
Will be sent postpaid by *The Iron Trade Review* at $6.

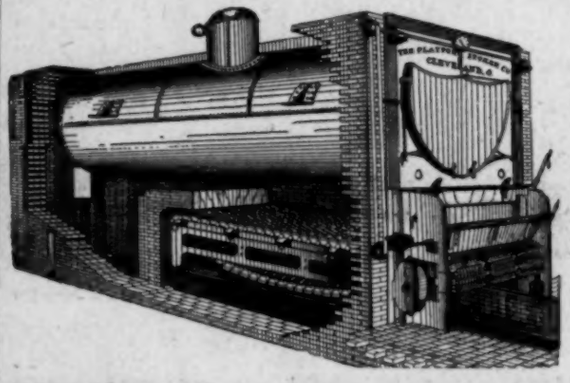
Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.

S-S, V-Crimp, Corrugated Roofing, Steel Siding, Ceiling, Lath, etc.
ROFING
The Cincinnati Corrugating Co., Box 353 Piqua, Ohio.

O. TEXTOR,
Chemist and Metallurgist
Analyses made of Metals, Ores, Fuels and Supplies for Furnaces, Steel Works and Foundries.
Ores sampled at mines, furnaces and lake ports.
Advice furnished to operators of Blast Furnaces Steel Works and Foundries.
Mining properties reported upon.
For 12 Years Chief Chemist to the Cleveland Rolling Mill Co.
158 Superior St., CLEVELAND, O.

JUNCTION IRON & STEEL CO.
WHEELING, W. VA., and MINCO JUNCTION, O.
MANUFACTURERS OF
Bessemer Pig Iron, Soft Bessemer Steel Blooms and Billets, Soft Steel Bars, scaled and sheared to lengths and weights, for Sheet and Tin Plate Manufacturers, also Soft Bessemer Merchant Bars
SUITABLE FOR
Agricultural Implement Makers, Wagon and Carriage Manufacturers, Car Builders and Locomotive and Railway Repair Shops.
Sales Offices: Room 14, Mason Bldg. Boston, Mass. 81 Fulton St., New York, N. Y. 519 Fidelity Bldg., Philadelphia, Pa. 421 Wood St., Pittsburg, Pa. 10 Wiggins Blk., Cincinnati, O. 638 The Rookery, Chicago, Ill. Security Bldg., St. Louis, Mo.
Rooms 811 and 812 Perry-Payne Bldg., Cleveland, Ohio.

AIR COMPRESSORS
Thoroughly up-to-date and the most simple, durable and economical machines on the market. Built on improved lines.
ROCK DRILLS, AIR LIFT, PUMPS, ETC.
Send for catalogue
RAND DRILL CO.
100 Broadway, New York.
1328 Monadnock Block, Chicago.


The Playford Mechanical Stoker
Guaranteed to
Abolish smoke, to increase boiler capacity and to save fuel.
For information, address,
The Playford Stoker Co.,
No. 61 Case Library Bldg.,
CLEVELAND, O.

Steel Stamps and Stencils.
FULLHARTY, J. H. & Co., Rubber Stamps Seals, Stencils, Automatic Check Punches and Numbering Machines. 92 Seneca St.

Bolt and Nut Works.
THE UPSON NUT CO., Manufacturers of Nuts Washers, Carriage, Machine, Plow, and Elevator Bolts, Coach Screws, etc.

PROUTY ELECTRO GASOLINE ENGINE
PRICES SMASHED.

H.P.	Weight.	Floor Space.	Speed.	New Price.	Old Price
3	900	20x30	375	$195	$300
4	1000	30x30	350	$220	$375
5	1100	34x32	325	$245	$450
6	1300	34x32	300	$270	$525

Larger sizes built to order at correspondingly low prices, quoted on application. Special prices made on HOISTS and PUMPS.
THE PROUTY CO., 334 Dearborn St., Chicago, Ill.

Robert W. Hunt & Co.
1137 The Rookery,
CHICAGO.
Analyses of Iron Ores.
Sampling of ores.
Analyses of all ores, oils, waters, metals, etc.
Inspection and consultation.

F. A. EMMERTON,
Analytical Chemist
AND METALLURGIST.
Ores sampled at lake ports, mines and furnaces.
Mines and Metallurgical Processes examined.
Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.
9 Bratenahl Building, CLEVELAND, O.

Persistence In Advertising
Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

BLOW YOUR CUPOLA
WITH A
"STURTEVANT BLOWER."
SEND FOR CATALOGUES.
B. F. STURTEVANT CO.
Boston. New York. Philadelphia. Chicago. London, Eng.

C. K. PITTMAN,
SHIPPER OF
Coal & Coke
Best Grades of Coke a Specialty.
975 Old Colony Building, Chicago.

THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. DECEMBER 3, 1896. CHICAGO, ILL. NUMBER 49.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Mill and furnace outputs continue at a fair pace, but new sales of pig iron and finished material grow less as the end of the year approaches. The problem ahead relates to the permanency of the basis for raw materials, and the data are not yet sufficient to draw definite conclusions. There are great expectations concerning 1897, but the ore producers, for example, as the great basal interest, will wait for more positive developments before they talk of prices for the new year. The feeling in this as well as in other departments of the industry is that a year with so large promise of recuperation calls for more than ordinary deliberation in the laying of plans. In actual business the past week may have disappointed those who expected an unusually active winter in compensation for the long wait; but the conservative element in the trade is not surprised even at some of the weak spots in prices that have shown themselves in the past ten days. In general, the tone is firm, but there are exceptions, and the struggle for tonnage in the usually dull weeks just ahead may bring lower quotations on mill products. Until there is business enough to make the big mills comfortable—and this is not likely before the approach of spring—they may be expected to show some eagerness in going after attractive orders. In the month since election, shipyard, bridge and car orders have been chief factors in the new business placed. Lake shipyards have much more to do than seemed probable a few weeks ago, and there are yet a few more contracts to be placed before the winter's quota is complete. Car work has been of some help to Western mills, forges and wheel foundries; but the bar mills are still far from a satisfactory basis. Pig iron buying has been restricted the past week. Bessemer is weaker, but the current business is done through second hands and is merely the passing into consumption of metal bought at the low figures of September and October. Foundry irons have been quiet. Sellers hold to advanced prices for forward deliveries, but old prices have been approached on prompt sales. The present open market on beams may give way again to agreement, another meeting having been called for December 4, in Pittsburg, at the instance of Eastern producers. The wire nail pool formally decided to dissolve, at the New York meeting, and a new card of extras will replace the unpopular schedule that was born with the pool. A period of cut prices will ensue, and meanwhile buyers will contract grudgingly, waiting to see how far the market will drop. There is no indication that prices for steel bars are being maintained on the pool basis for billets. Some mills are quoting 1.15c to 1.20c, but sales at 1.05c, Pittsburg, have not ceased.

THE CLEVELAND DISTRICT.

Low freights have been a temptation to get down ore in the face of conditions ordinarily prohibitive, and on Dec. 1 six cargoes were still to be loaded at Escanaba, while from Marquette three or four vessels are yet to come. The round-up is likely to show more than 9,500,000 tons by water, and to this must be added rail shipments that will be upwards of 300,000 tons, to get the total shipments for the year. The iron ore selling companies have had a meeting the past week to talk over the situation and take account of stocks on the docks. Nothing was said about prices and that matter will wait until the new year is well opened. Sales of Bessemer ore the past season have been in the neighborhood of 5,000,000 tons, though shipments have exceeded this by fully a million tons.

Pig Iron. It has been a quiet week in the local pig iron market. Sales of foundry grades are fewer and the disposition among buyers to keep stocks small for inventory is apparent. For early delivery our quotations are shaded by some sellers. Foundrymen make varying reports about new work, some having more contracts than of late, while others find little revival in demand. Some Lake Superior charcoal has been sold, but no considerable sales from stocks at lower lake ports are expected so soon after the close of navigation. No sales of Bessemer by valley producers are reported, though some iron is offered and some is being sold by middlemen, at $11.35 at valley furnace. The starting of the Sharon Iron Co.'s furnace makes seven active stacks in the Shenango valley, with two at Leetonia and six in the Mahoning valley, and another soon to start. We quote:

Bessemer	$12 25@12 50	Valley Scotch No. 1	$12 00@12 25
No. 1 Strong Foundry	11 65@12 15	Valley Scotch No. 2	11 50@11 75
No. 2 Strong Foundry	11 25@11 40	Gray Forge	10 65@10 75
No. 3 Foundry	11 00	Lake Superior Charcoal	13 50

Finished Material. Actual sales the past week have not been large apart from material for a new Globe Iron Works Co. boat and that for a caisson and intake in connection with the new water works crib construction. The plates in both casses went to Cleveland; the shapes for the vessel were taken by Pittsburg and for the crib contract by Cleveland. Prices on plates have shown much uneveness in local bids recently, shading down from 1.17½c Cleveland to a price almost as low as has been made in this market in the past two years. The competition from the Chicago district has been more pronounced of late, which probably accounts for some exceptional figures. On ordinary business 1.10c Pittsburg is asked, which with the new freight of 10c since Dec. 1 would make the Cleveland price 1.20c for tank steel. Beams and channels are maintained at 1.45c Cleveland. At a meeting in Pittsburg this week an effort will be made to revive the pool agreement. Architectural work is scarce, but a sale of 200 tons is reported on bridge account. Billet business is wanting. Rods are in light demand; on a small lot $27 was paid recently. We quote steel bars at 1.15c to 1.20c, Cleveland; bar iron, 1.15c; No. 27 sheets, 2.20c to 2.25c.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Dec. 2.

Considerable business was closed last week in steel. The local mills sold some round lots of their various manufactures and several, good orders were placed with Pittsburg mills. It is thought, however, that the month of December will not show any very large sales, but that business will be quiet until after the turn of the year. Sales of pig iron last week were limited to comparatively small lots except in one instance and the inquiry does not indicate that business for December will be very large. Prices on pig iron and bar iron have been very firm but quotations of steel shapes are weak and in several instances sales have been made at figures under those we give.

PIG IRON.—The largest sale last week was one of over 3,000 tons of Northern No. 1 foundry. Aside from this, orders were limited to comparatively small lots, although the aggregate of these made a fair week's tonnage in both Northern and Southern iron. Shipments on contracts are quite a little better than they were a week ago and are improving all the time. Lake Superior charcoal iron is quiet and sales for only small lots have been made. Prices are very firm for Southern irons and for deliveries extending beyond the next three months, an advance of 25c a ton over our quotations is asked. Northern furnaces would probably be willing to make small concessions to good customers for quick deliveries.

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$11 15@11 40
Local Coke Fdy. No. 1	11 75@12 25	South'n Silveries No. 1	12 15@12 65
Local Coke Fdy. No. 2	11 25@11 75	South'n Silveries No 2.	11 65@12 15
Local Coke Fdy. No. 3	11 00@11 25	Jackson Co. Silveries	14 00@16 05
Local Scotch Fdy. No. 1	11 75@12 25	Ohio Silveries No. 1	15 00@15 55
Local Scotch Fdy. No. 2	11 25@11 75	Ohio Silveries No 2	14 50@15 05
Local Scotch Fdy. No. 3	11 00@11 25	Ohio Strong Softeners	14 00@14 28
South'n Coke No. 1	12 15@12 65	Alabama Car Wheel	16 65@17 15
South'n Coke No. 2	11 40@11 90	Malleable Bessemer	12 75@13 50
South'n Coke No. 3	10 90@11 40	Coke Bessemer	13 00@13 50
Southern No. 1 Soft	11 65@12 15		

BAR IRON.—Several contracts of moderately large size were placed last week and general business was very fair in small lots. The mills are not looking for any very large business during December. Quotations are made as follows: Common iron, 1.15c to 1.20c; guaranteed, 1.20c to 1.30c; soft steel bars from strictly billet stock, 1.25c to 1.35c.

RAILS AND TRACK SUPPLIES.—There is nothing new to report in this market. The only business being done is in light sections and for only small lots of these. Prices are made: Rails, $29; splice bars, 1.30c to 1.35c; track bolts, with square nuts, 1.90c to 2c; hexagon nuts, 2c to 2.10c; spikes, 1.65c to 1.75c.

BILLETS AND RODS.—Several round lots of both billets and rods were sold last week by the local mills, the aggregate making a very good tonnage. Billets are unchanged at $21.25 and rods are quoted at $30.

STRUCTURAL MATERIAL.—A contract was let last week for the Lakeside building, which will require 600 tons of material. An order was given for 2,000 tons of bridge material and several contracts for smaller lots of this material were also placed. The contract for the building of the Western Electric Co., at New York, was taken by a Chicago contractor, the material to be made in Pittsburg. This will require either 1,200 or 2,400 tons of material, according to which of two sets of plans under discussion is finally decided upon. Two or three contracts for car material were also placed. Quotations are inclined to be weak and in several instances sales have been made at prices under those we give. Quotations are made as follows: Beams and channels, 1.60c to 1.65c; angles, 1.30c to 1.35c; plates, 1.30c to 1.35c; tees, 1.50c to 1.55c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—Several contracts for large lots were closed last week by the local mills, most of the business coming from boiler and tank manufacturers. Quotations are inclined to be weak and sales have been made under our figures: Tank steel 1.30c to 1.35c; flange steel, 1.50c to 1.60c; fire-box, 2.15c to 5c.

SHEETS.—The market has been quiet and no particularly large sales have been closed. Quotations are maintained very well and are made at 2.25c to 2.30c, for No. 27 black and 80 to 80 and 2½ per cent discount for galvanized.

MERCHANT STEEL.—No single sales of any consequence were closed last week and the inquiry does not indicate an increase in business before the first of the year. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.55c to 1.65c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD RAILS AND WHEELS.—The market was quiet last week and sales did not include any large lots. Quotations are made at $14.50 and $15 for old iron rails; $10.50 to $11 for old steel rails, and $13 to $13.50 for old wheels.

SCRAP.—Very few sales of any size were closed last week and none are in prospect for the immediate future. It is not expected that there will be any improvement in business before the first of the year. The market is about as follows: Railroad forge, $12.50 to $13; dealer's forge, $10.75 to $11; No. 1 mill, $8.50; heavy cast, $9.50 to $10; malleable cast, $9.50 to $10; axles, $16; cast borings, $4; wrought turnings, $5.50; axle turnings, $7.25; mixed steel, $7.50; stove plates, $5.75; heavy melting steel, $9 to $9.50.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Dec. 2.

In both iron and steel there is evident relaxation from the activity common in almost all lines during November. Aside from one lot of Bessemer, 10,000 tons, no iron has been taken and none sought in the week. Almost all finished lines share the quiet and some prices are easier. Plates and sheets are least affected, the former particularly being in good demand. There is no lack of confidence in the returns 1897 will bring to the iron trade, and any present quietness is regarded as only what is to be expected at this time of year.

PIG IRON.—Thanksgiving week was an extremely quiet one in local iron circles. But one transaction of consequence is reported in Bessemer, foundry or mill iron. A Mahoning valley steel interest purchased through Pittsburg 10,000 tons of valley Bessemer for delivery to February, on a basis of about $11.35, valley. Other than this, no inquiry of any considerable size has been current, nor has even a fair tonnage of small wants been supplied. The opinion is general that the spirit of speculative buying, which followed election and was mistaken by some for reviving consumptive demand, has spent itself and the natural reaction is being felt. The iron held by speculators is likewise having a tendency to "bear" the market, and in consequence Bessemer is weaker than at any time during November. So little has been done that the market is with difficulty located, but is accepted to $12 to $12.25 Pittsburg. Gray forge, after the unusual buying of the week preceding, lapsed into inactivity and weakened slightly in price, being held at $10.40 to $10.50. Foundry iron is firm, but quiet. The Pittsburg market stands as follows:

Bessemer	$12.00 to $12.25
No. 1 Foundry	12.00 to 12.25
No. 2 Foundry	11.25 to 11.50
No. 3 Foundry	10.75 to 11.00
Gray Forge	10.40 to 10.50

BILLETS—Current rumors of dissatisfaction among pool members, while mainly incorrect, have had some foundation. It is charged that loop holes are

already discovered in the new agreement and there is some indication of dissatisfaction. Aside from some sheet bars there has been no steel sold and Edgar Thomson and Hainsworth Steel Works are both off this week. Cheap steel is likewise a drug on the market.

STRUCTURAL MATERIAL.—The break in beams and channels has contracted rather than stimulated buying in structural shapes. Business closed in the week has aggregated considerably less than for some weeks past and inquiries are likewise fewer. Larger mills are maintaining the market on beams at 1.35c, Pittsburg, but there are reports of material offered at 1.25c. Angles and universal plates are not affected. Aside from specifications on old contracts no orders of any size have been taken since the last report. We quote: Beams and channels, 1.35c; angles, 1.15c to 1.20c; universal plates, 1.15c; tees, 1.30c to 1.35c; zees, 1.30c to 1.40c.

BARS.—The advance in steel bars announced as a result of the billet meeting has not so far been maintained. While some firms are quoting 1.15 to 1.20, other local mills are eagerly covering at 1.05 to 1.10. The volume of business is not yet of sufficient size to prevent cutting and rather than shut down mills are accepting low prices. There has been some muck bar iron sold of late but on common iron no change is apparent. While 1.15c is maintained in Youngstown, 1.10c is shaded here, and there is little at that figure. All muck bar iron is quoted at 1.20c to 1.25c.

WROUGHT PIPE.—While casing, tubing and merchant pipe show a fair advance over business closed in October, there is much to discourage larger mills. Both mills and dealers have receded from the advanced prices quoted soon after election and cannot book orders at most liberal concessions. Little pipe line work is in sight. Five tens and 5 per cent on wrought iron and six tens on steel pipe are openly quoted and these prices are said to be frequently shaded. Skelp is only fairly active as quoted below: Grooved steel skelp, 1.05c to 1.07½c; sheared, 1.17½c to 1.20c; grooved iron skelp, 1.20c to 1.25c; sheared, 1.30c to 1.35c.

PLATES.—Plates have more nearly held their own in the general slump of finished business during the week. Boiler requirements have been covered in fair sized lots, but the aggregate of orders is somewhat smaller than last week. Prevailing prices are: Tank, 1.15c; shell, 1.25c to 1.30c; flange, 1.35c to 1.40c.

MERCHANT STEEL.—There has been a very quiet week with prices unchanged as follows: Soft steel bars, 1.20c; machinery straightened tire, 1.40c to 1.45c; spring, 1.30c to 1.35c; open-hearth spring, 1.55c to 1.60c; machinery, 1.30c to 1.35c; toe calk, 1.55c to 1.60c; sleigh shoe, 1.45c to 1.50c.

SHEETS.—Black sheets are in line with the general reaction and little business has been placed. So far prices have not been affected and are quoted as follows: No. 26, 2.10c; No. 27, 2.15c to 2.20c; No. 28, 2.25c to 2.30c. Galvanized sheets are slightly weaker also, owing partly to the late season. Some fair sized orders were placed last week. The quotation is 80 per cent off list.

OLD MATERIAL.—Speculative stocks are having their effect on the scrap market and available business is taken at figures below those asked by dealers. Some No. 1 wrought scrap and heavy melting stock were sold during last week, but in small quantities. The market is still uncertain and we continue to quote: Wrought scrap, $11 to $11.50; cast scrap, $10 to $10.25; car wheels, $11.50, gross; old iron rails, $15 to $16; old steel rails, $13 to $13.25; coil spring, $10.75 to $11, gross; hammered iron axles, $16 to $16.50, net; rolled iron axles, $14 to $14.50; heavy melting stock, $12.50 to $13; machinery cast, $9.75 to $10.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The pig iron market was kept buoyant in November, following the liberal sales of September and October, by the belief on the part of many that general activity was to characterize the metal markets at once, with further advances. The conditions, however, beyond giving financial ease and confidence, and the assurance of a brighter future as to federal revenue and industrial protection, have not changed, and a little time must elapse before the fruits of the late elections can mature in rich and ripened results. There are no disappointments as to the current volume of business, perhaps, except on the part of those who were too sanguine and expected too much immediately. The lateness of the season, the close approach of the holidays and the annual stock-taking period preclude the quick development of many plans and projects under consideration, but there prevails a general confidence in a steady, healthy progress toward general prosperity. Some important orders have been placed the past week, and much work is being figured upon, so that it is reasonable to believe that the business of the remnant of the year will approximate at least the normal. We quote as follows: Southern coke No. 1 foundry, $10.75 to $11; No. 2, $10.25 to $10.50; No. 3, $9.75 to $10; gray forge, $9.50 to $9.75; mottled, $9.50 to $9.75; No. 1 soft, $10.50 to $10.75; No. 2, $10 to $10.25; Hanging Rock charcoal No. 1, $15 to $16; Tennessee charcoal, No. 1, $13 to $14; Jackson county silvery, No. 1, $13.50 to $14; Standard Alabama car wheel, $14.75 to $15.50; Tennessee car wheel, $13.50 to $14.50; Lake Superior car wheel and malleable, $14.75 to $15.25.

Philadelphia Demand in all lines has been but moderate the past week, but prices are steady and deliveries are being made with more regularity. Some quotations have been made on pig iron for delivery through 1897 at 50 cents above to-day's prices, but buyers are disposed to wait a few weeks until there are clearer developments about the new year. There is no dissent from the view that consumption of iron will be heavy next year and the feeling is generally hopeful. Prices for seaboard deliveries are quoted: No. 1 X foundry, $12.75 to $13.25; No. 2 foundry, $12.25 to $12.75; No. 2 plain, $11.75 to $12; standard mills irons, $11.25 to $11.50; ordinary mill irons, $10.75 to $11. The steel market is quiet and little is expected of it for the balance of the year. Speculation is active as to the action of the steel rail association concerning prices for 1897, and an early announcement is expected. There is an opinion that some reduction will be made, but it appears to be founded rather on the ideas of buyers than upon any official intimation. The termination of the agreement as to prices on beams and channels was due to the irreconcilable differences between larger and smaller producers as to tonnage in a proposed allotment. There is little likelihood that another arrangement will be made soon, though an understanding is probably among producers in certain districts, and prices are more likely to be maintained in the Central West than in the East. Considerable shipyard and bridge work is under way and mills are fairly supplied for December. Plate mills are in better shape, but bar mills have made low figures for December shipments. We quote as follows: Tank plates, 1.30c to 1.35c; bar iron, 1.15c to 1.20c; best refined bars, 1.25c to 1.30c; steel bars, 1.25c to 1.30c; angles, 1.20c to 1.30c; beams and channels, 1.55c to 1.65c.

THE Troy (N. Y.) Steel & Iron Co. is erecting a new building alongside the converter structure on its Breaker Island plant. It will be used for the temporary storage of molten iron from the blast furnace and cupolas, so that it may be kept heated for the next blow.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

PUBLISHED EVERY THURSDAY BY

THE IRON TRADE REVIEW CO.,

CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET:

G. H. GARDNER, President. A. I. FINDLEY, Editor.

CHICAGO: 1142 MONADNOCK BLOCK. B. M. GARDNER, Associate Editor and Western Manager.

PITTSBURG: 807 TRADESMEN'S BUILDING. JAMES R. MILLS, JR., Manager.

Subscription (strictly in advance), $3 per annum. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW, through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

DECEMBER 3, 1896.

IN giving the official statistics of pig iron production in Great Britain in the first half of this year, an English contemporary says that the output of 1896 in the United Kingdom will probably be the largest on record. The greatest annual production hitherto was 8,586,680 tons in 1882. For the first half of the present year the total was 4,328,444 tons, or at the rate of 8,656,888 tons a year. The probabilities are that the output in the second half of the year will keep well up to the rate of the first half, in view of the sustained demand that appears in nearly all departments of British and continental industry. In the United States the official figures showed an output of 4,976,236 gross tons to June 30 this year, and if this rate had kept up for another six months the total would have been far beyond any record. But the shrinkage in summer and fall was great. Based on the blast furnace statistics for the first of each month, with allowance for the reported resumptions of furnaces in November, the production in the months since June has been approximately: July, 780,000 tons; August, 675,000 tons; September, 635,000 tons; October, 465,000 tons; November, 550,000 tons. Estimating the December output at 625,000 tons, would make a total for the year in the neighborhood of 8,700,000 tons. The self-congratulation of an English exchange—"it is gratifying to feel that we have once again resumed our old position, unchallenged until the year 1890, of being the leading iron-producing country in the world"—may turn out to be premature, even if it be restricted to a comparison of figures for 1896. It is true that Great Britain exceeded the United States in pig iron production in 1894, making 7,427,342 tons against 6,657,388, but the year on this side was one of woeful depression. In the peculiar causes for a falling away that have existed with us this year and the contrasted quickening of industry experienced in Great Britain, there is furnished probably the best opportunity likely to occur in a generation for the temporary re-assertion of British leadership. But whatever the relative positions this year, with 1897 the United States will resume the place it took in 1890, and continue the advance on the lines of its manifest destiny.

It is becoming clearer as sentiment is given time to crystallize, that there will be no makeshift on the tariff and that a consistent, amply protective measure will be given to the country as speedily as may be under the new administration. It now seems well assured that the Dingley bill will not be pushed for passage; that it would not be allowed to become a law, should the Senate pass it; that an extra session of Congress will be called by the new President; that a tariff bill, on the principle of specific duties, will pass the House, and that the Silver Senators will not obstruct. In short the developments are more favorable than at any time since the election, for such legislation as the country must have, to start it fairly on the road to prosperity. The *Bulletin* of the American Iron and Steel Association, which has done much to make sentiment against any temporizing or compromising policy, sums up its contention as follows:

> The attempt to belittle the importance of the tariff issue in the late campaign will not succeed. The attempt to substitute the Dingley emergency bill, framed a year ago, for a tariff that will be thoroughly protective of American industires, has already failed. President-elect McKinley and the wise and trusted leaders of the Republican party are firm in the conviction that a large majority of the people desire the total repeal of the Wilson tariff, and they agree that the need of the Treasury for more revenue and the need of many industries for greater protection unitedly demand a special session of Congress for the consideration and passage of an entirely new tariff measure. The Dingley bill, if it were possible to pass it this winter and enact it into a law, could not go into effect before the first of March or the first of April next, while an entirely new measure of relief, to be passed at a special session, to meet early next spring, could go into effect on the first of July next. There is therefore no good reason why a special session of the new Congress should not be called as one of the first acts of the new president. The people as a whole, even a majority of Sound Money Democrats, expect that this will be done.
>
> At the same time it may be well to add that nobody who has any authority to speak for the Republican party or for any of the great industries of the country expects or desires a revival of the letter of the McKinley tariff of 1890. That tariff, with scarcely an exception, the repeal of the sugar duties being a conspicuous exception, was an eminently wise measure, but there are few industries of the country that will need the same measure of protection in 1897 that they needed in 1890. We hope that the Republican members of the Ways and Means Committee of the House of Representatives, all of whom will probably serve as members of the same committee in the new Congress, will at once address themselves to the work of framing an entirely new tariff bill, taking the classifications and phraseology of the McKinley tariff as a model, and adhering to specific rates in every case where it is possible to do so. They can do this work far better than any tariff commission that could be devised.

The acquisition of the Aetna, or Lowmore, mine on the Mesabi range by the Thomas Furnace Co., of Niles, O., suggests that the tendency is growing among furnace companies, to secure control of sources of ore supply. In the past season the Illinois Steel Co., which had some interest in a few minor properties some years ago, but produced little ore, has taken hold of two mines whose product is adapted to basic practice, and when the projected open-hearth plant at South Milwaukee is

completed will draw upon red fossiliferous ores at Iron Ridge, Wis., which it has been developing of late. On the Mesabi range, the Oliver and Lone Jack, Biwabik, Mahoning, and Sellers properties send the greater part of their product to controlling consuming interests, while the Hale is under an exclusive contract to a furnace company. There are now but one or two properties on the range that are not either controlled by buyers of ore, or by one of the two great interests that own their own rail and water transportation lines. Speaking generally, the past few years have further emphasized the drift of the ore business either into consumers' hands or into those of strong companies, controlling railroads and vessels, and with the single exception of the Rockefeller syndicate, maintaining more or less close relations with furnace firms or steel companies. Through these various ramifiying lines, the destination of a larger proportion than ever of the Lake Superior output, can be predicted with certainty before the opening of the season. The independent producer must have an especially desirable ore if he would thrive alongside this great web of interlacing interests.

A correspondent takes exception to the following concluding paragraph in an article reprinted in our last issue from the *Locomotive*:

The general conclusion to be drawn from this example, we suppose, is that cast iron should not be used for steam pipe. This is a corollary to the more general proposition that cast iron should not be used in any place where it will be exposed to a tensile stress. It is good enough material for resisting compressive strains, but it is altogether too uncertain in its behavior to be trusted under tension.

"If this is true," pertinently queries our correspondent, "why are engine cylinders made of this same metal?"

Lake Superior Iron Mines.

The Commonwealth Iron Co. has taken an option on the Bessie mine, situated about a mile from Humboldt, onthe Marquette range. The Bessie has never shipped any ore and it has no railroad connection. The shaft is sunk to two levels. Previous assays of the ore showed 57 per cent in metallic iron, but it is expected to run up to 61 in iron at greater depth.

All the available men at Soudan, Minn., were set at work in the Minnesota Iron Co.'s mines last week. It is expected that 800 mechanics, miners and surfacemen will be employed this winter.

At the Hemlock mine, in Iron county, Mich., more recent workings have been immediately under the bed of the Hemlock river. The dripping of water from overhead gave the miners some alarm and fear of a repetition of the Mansfield mine disaster led to a suspension of operations. It is proposed, instead of attempting to divert the stream into a new bed, to build a dam and to lead from the dam a great wooden sluice-way, spanning the ground over the mine and resting on two arches. The sluice will be of matchwood lumber and it is claimed will be built so that leakage can be avoided. Mining can then be carried on in safety and it is proposed to work upward, in time caving in the old river bed.

The Tilden mine at Bessemer, Mich., resumed on Dec. 1 with 300 men, which will be increased somewhat.

From the Minnesota ports at the head of Lake Superior—Two Harbors, Duluth, and Superior—which send forward all the output of the Mesabi and Vermilion ranges, the shipments this year have been the largest yet recorded, though not greatly in excess of last year's. In 1895 the three ports named sent down 3,834,823 tons. This year's total is 3,970,924 tons. The Vermilion range sends down this year 1,085,000 tons, almost identical with its shipments by water last year. The Mesabi total will be about 2,885,000 tons, or over 100,000 tons in excess of that for 1895, which was 2,781,587 tons.

DEATH OF JOHN TOD.

The news comes from Columbus, O., that John Tod, the well known head of the firm of Tod, Stambaugh & Co., of Cleveland, dropped dead at the Chittenden House, at an early hour this (Thursday) morning. Death was caused by a stroke of apoplexy. Mr. Tod was in Columbus attending a meeting of the State House Improvement Board, to which he was appointed recently by Gov. Bushnell. The news was a shock to all Mr. Tod's business associates in Cleveland, among whom he had been prominent for more than a third of a century.

A son of the late Gov. Tod, of Ohio, John Tod was born on the Western Reserve 62 years ago. His connection with the business interests of Cleveland began about 40 years ago. The original firm of Tod, Rhodes & Co., was succeeded by Tod & Morris, later by Tod, Morris & Co., and in 1883, John Tod formed a partnership with John Stambaugh and Robert McCurdy, of Youngstown, under the name of Tod, Stambaugh & Co. The firm originally handled only coal, the members being individually interested in properties in the Mahoning valley and near Akron, O., and in the Youghiogheny valley. In later years Mr. Tod's chief coal interest was in the Port Royal Coal & Coke Co. Iron ore and pig iron connections were also formed by the firm. A specialty was made at first of non-Bessemers, the Florence, Iron River, Corbett and

Youngstown ores being handled. Brier Hill Scotch, Arnold-Tod and Douglas pig irons were also sold, the members of the firm having an interest in the Brier Hill Iron & Coal Co., of Youngstown, whose blast furnaces are to-day among the largest in the Mahoning valley. Tod, Stambaugh & Co. were among the first iron ore selling firms to become identified with mining properties on the Mesabi range, the sales agency for the Biwabik being taken at the start. The firm also handles the product of the Adams and Ohio mines on the Mesabi, and of the Shores mine on the Gogebic.

Recent newspaper publications concerning the plans of the Otis Steel Co., Ltd., have been misleading. The statement has been made that $50,000 has been raised for improvements, and a mortgage given to secure the loan. The facts are these: In June, 1895, when the company was in receivers' hands, a scheme of arrangement was drawn up by the liquidator and approved by the proprietors and subsequently by the courts. Under this scheme prior lien bonds to the extent of £50,000 (not dollars) were to be issued andthe proceeds devoted to the improvement of the works. This arrangement has since been carried out, the reconstructed company taking possession on the first of June, last. The old company was perfectly solvent, with a large surplus balance to its credit, when it passed into the hands of receivers. All outside creditors were paid in full. No mortgage loan nor any loan other than that referred to under the reorganization plan has been effected or required by the present company.

THE WARRANT SYSTEM AND STEADY PRICES.

BY GEORGE H. HULL.

The steadying effect of an ample visible supply of any staple article of manufacture is apparent, but the importance of this in the case of pig iron is far from being appreciated. In fact there is in the United States no great staple article that is allowed to drift so helplessly in the storms and sunshine of trade as this important product. It is generally admitted that no manufacturing business can be safely be carried on, or made reasonably continuous and profitable, if it depends upon a raw material that is subject to great fluctuations in price. Iron enters more generally into all the great enterprises and improvements of this age than any other staple. It is, therefore of the first importance that the fluctuations in its price should be confined within reasonable limits; otherwise the business of the whole country must be disturbed, when these excessive fluctuations occur. To realize how important the price of pig iron is to a long continuance of the prosperous condition of general business, we have only to consider the universality of its use, and to examine the effect its fluctuations have had on the business of this country in the last 50 years.

The history of pig iron in the United States is a succession of periods embracing a quick and enormous advance in price, followed by a quick and enormous decline, resulting in several years of depression and unremunerative prices. These abnormal advances have been caused in every instance by the small surplus stocks carried in the United States, and the struggle of each manufacturer to obtain enough to supply his needs at each recurrence of a general revival in business.

It was the revival in business and small stocks in 1854 which carried iron from $19 to $50. Everything was prosperous, but $50 iron put a stop to many of the great enterprises; thousands of men were thrown out of employment all over the country; the new furnaces built on high prices came into blast, prices commenced to tumble, and the great panic of 1857 resulted; the price of iron had fallen to $27—but it did not stop there; it continued to fall, until it reached $18 in 1862. The five years of depression ruined furnacemen, right and left, and many of their plants fell into decay.

Stocks were again at a low ebb when the revival of business in 1863 put iron on the up-grade again; there was an actual famine in iron. Prices jumped several times, as much as $5 per ton in a single day; but even $50 iron could not stop the prosecution of the war and its attendant necessities, and iron during the following year reached $80 per ton in the Middle States, and $74 per ton in the East.

After the great war-consumption ceased, iron dropped to $35 (in 1870), but the increased demand of 1872 put the price up to $60 in the Middle States; again the great enterprises were stopped by the high prices, and the panic of 1873 soon followed. Within the first year of the panic it dropped to $35, which was less than actual cost in the Middle States, labor and all raw materials entering into its production having advanced so largely in 1872; but it did not stop at $35. It continued to drop, until it reached $20 in 1879, and in these six years it was produced at a constant loss, as a decline in the price of iron always precedes, by a long period, the reduction in the cost of its manufacture. Again, in 1880, the small stock and renewed business carried iron to $45.

Will anyone claim that these enormous advances were not important factors in stopping the building of railroads and other large enterprises in each of the periods named, or that the discharge from employment of many thousands of workmen which this stoppage occasioned, was not the beginning of the panics that followed? No other great staple is subject to these enormous fluctuations, for the reason that larger stocks of the other staples are carried; but just in proportion as you stop the consumption of pig iron, the consumption of lumber and most other great commodities is checked. It must, therefore, be admitted that a large accumulation of surplus pig iron in seasons of dullness is the only condition that would prevent these enormous advances in price when prosperous business periods return; but the question is: how can these large surplus stocks be accumulated and carried without injury to the furnace business?

Experience proves that the manufacturers of pig iron rarely carry a combined stock exceeding two or three weeks' production, and that the accumulation of even one additional week's production will carry prices down unreasonably. Manufacturers make their iron to sell; if they cannot get one price they will usually take a lower. Some of them have money enough to accumulate iron; others have not. The poorer furnaces, which are compelled to sell, lead the decline, and the rich ones must accept the price made by the poor ones. Experience proves also that consumers of pig iron will not carry large stocks. Among the few that have surplus money in their business, some addition is made to stocks when prices are going up; but, in the several years that prices are going down, consumers generally buy to supply only their immediate wants, and at no time is their stock so light as at the end of several years of depression.

As a broad principle, then, large surplus stocks of pig iron will not be carried by either the manufacturer or the consumer. It will be done only by some middle element, as is the case with other great staples. In the case of general articles of trade, like dry goods and groceries, it is done by the jobber and retailer; this we will designate as "natural carriage." In the case of large staples, like cotton, grain, petroleum, provisions, and pig iron, it can be done only by storing the article itself, issuing a negotiable certificate against it, and bringing about general dealing in these certificates on exchanges; this we will designate as "certificate carriage," or "warrant system." Every great staple except pig iron has had this "certificate carriage" established for it in this country. In the case of each of these staples the majority of the producers at the start have been unfavorable to the introduction of that particular commodity on exchanges. They reason that, if the small "natural carriage" of surplus stocks depressed prices, a large "certificate carriage" would depress prices more violently still. They reasoned too, that the fluctuation in that article would be increased by its introduction to exchanges.

A careful examination into the history of every staple article that has been introduced by certificates to exchange dealings proves that both of these theories are unfounded. On the other hand, an exhaustive examination shows that the extreme fluctuations have ceased, in the case of each of the staple articles, after the introduction of that article to exchange dealings. We will give but one illustration:

Petroleum, before it was introduced on exchanges, showed violent fluctuations for nine years, ranging from 52 cents to $7.88 cents per barrel at the well. A surplus stock of a half million barrels carried the price down to 52 cents. The extreme fluctuation for nine years after it was introduced to exchanges was from 64 cents to $1.06, and a surplus stock of 36,000,000 barrels carried the price down only to 64 cents. Every great staple that has been introduced to exchange dealings in this country has experienced like results, the producers of these articles as well as the consumers, realizing a steadying effect not experienced before. Just in proportion as pig iron enters into the general business of this country will the general business of the country be benefited by the introduction of a system that would curtail the violent fluctuations in its price.

It is believed by some that this "warrant system" will not absorb large stocks of pig iron, and they cite the fact that even moderate lots of 10,000 or 20,000 tons of speculative pig iron, such as have been carried during various times in the last 20 years, have always depressed the price; but they lose sight of the fact that these speculative lots have been carried by unnegotiable storage receipts, and such carriage has always been, and always will be, harmful to the iron trade. There is, however, between this carriage and the carriage by a negotiable certificate dealt in on exchanges, the widest difference.

This "warrant system" has existed in Scotland for over 50 years, and for 30 years out of this time surplus stocks of pig iron in Scotland have been equal to from six to 12 months' production. During one period the stock for five years in succession exceeded a year's production. What better assurance can there be of the benefit of this system than its 50 years' history in Scotland? That market has not been subject to the violent fluctuations which have occurred in the United States, and the manufacture of iron in that country has been more uniformly profitable.

Many believe that the investing and speculative public will

not absorb a large stock of pig iron through exchange dealings, but there is no real foundation for this doubt. The public will not carry unnegotiable storage receipts, just as the public would not carry petroleum stocks until they were put in proper shape; but, as soon as these stocks were represented by exchange certificates, the public quickly absorbed 36,000,000 barrels, and carried it without any depressing effect, and that same public will carry all the surplus pig iron that can be accumulated in this country under the "warrant system." More than one-fifth of the entire wealth of the United States today is invested in the carriage of property represented by certificates. The addition of stocks, bonds, and certificates on the New York Stock Exchange alone averages about 400,000,000 per annum. It is really the only shape into which property is put in which the money may be said to seek the property. There is no reason to doubt that this class of money owners will absorb all the surplus iron that is represented by negotionable exchange certificates. They have absorbed like certificates for all the surplus cotton, grain, petroleum, provisions, etc. The actual expense of carriage to the investor, on pig iron, is about one-fourth what it is on all these other great staples. It is this feature that has tended largely to make pig iron warrants the favorite speculative commodity in Great Britain for many years.

We have had no such violent fluctuations in price of iron during the last ten years as we had during the 30 years previous, for the reason that we have had no such violent and long-continued panics, and the cost of iron is permanently lower; but the moderate revival in business in 1889 and 1895 caused an advance of 75 per cent to 80 per cent, and these ruinous fluctuations will continue until large surplus stocks are carried.

This "warrant carriage" not only is a benefit to the trade during seasons of business activity, but is of equal benefit in another way during seasons of depression—by absorbing the surplus as it is made, thus enabling the furnaces to continue in blast, without overloading and depressing the consumers' market, whereas, without this system, the furnaces go out of blast, in about the proportion that the consumers cease to buy. We have had an illustration of this during the last few months.

In the Shenango and Mahoning valley, where the "warrant system" had not been adopted, there were, in January, 22 furnaces in blast, 19 of which had gone out of blast by August 15. In the Alabama and Tennessee district, where the "warrant system" had been adopted by most of the furnace companies, there were, in January, 32 furnaces in blast, only seven of which had gone out of blast by August 15. In fact, every furnace company in the southern district which had adopted the system was not only able to keep its furnaces in blast at the time of greatest depression, but was able to sell, through exchange warrants, all its surplus stock at satisfactory prices. An effort to force off 10,000 tons in the first named district during the depression in August resulted in only a small sale, at $1.50 per ton below quotations whereas, in the southern district, where the system had been adopted, 50,000 tons were easily sold by warrant, at the same time, on a concession of ten cents per ton, followed by a sale of another 50,000 tons at a substantial advance.

The conditions in these two districts were very different, but this does not affect the point we wish to illustrate—namely, that the previous introduction of the "warrant system" in the South had created a trade for southern warrants which quickly absorbed all the surplus iron as soon as the demand from the consumers ceased, a condition wholly lacking in the valley district.

A prominent iron master of Great Britain recently said, in reply to a question as to the usefullness of the "warrant system" to producers and consumers in Great Britain: "They simply could not get along without it. It is a necessary adjunct to the iron business. Consumers and dealers who desired to make prices on large lots of manufactured iron and steel for long future delivery would be obliged to take a large risk of the market, if it was not for the 'warrant system.' As it is, they can always protect themselves on these bids by purchases of warrants. Then from the producers' point: Furnace companies having on their yards a large stock of iron, or a large stock of raw material, if they anticipate a decline in the market, can telegraph to Glasgow and sell 10,000 to 20,000 tons by warrants within a few minutes, without affecting the price more than one or two pennies, whereas, if they attempted to sell a like amount of iron to consumers, they might be a week in doing it, and would depress the consumers' market as many shillings, as they would pence by selling on the warrant market."

The general adoption of exchange dealings in pig iron would enable the producers to market all their surplus product in times of depression, without undue lowering of prices. The accumulation of large surplus stocks through this means would not prevent a reasonable advance in prices in seasons of large demand, but would prevent the enormous advances which quickly hamper and eventually paralyze great enterprises. "Stability of value is the safeguard of the producer and consumer alike."—[Engineering Magazine for December.

Industrial Activity at Chicago Heights, Ill.

The effects of the election result are being felt to a large extent at Chicago Heights, Ill. This town is purely a manufacturing city, and would be among the first to feel a resumption in business in industrial lines. The Chicago Heights Land Association furnishes the following list of factories at Chicago Heights that have found it necessary to put additional men to work:

The Inland Steel Co. has added 75 men to its force since the result of the election was announced, and every piece of machinery and every foot of space in the works are in use.

The Walburn-Swenson Co., manufacturers of mining and sugar machinery, has added 50 men, and will begin this week to operate its entire plant day and night.

Seventy-five more men begin work at the Chicago Carriage Co.'s factory this week.

The Canedy-Otto Mfg. Co. has increased its force by 60 men. This company manufactures all kinds of blacksmith's tools, portable forges, taps, dies, etc.

The Q. & C. Co., manufacturers of railway specialties and supplies, has added 35 men to its present force, which is an excellent proof of the demand for its goods.

Wood, Smith & Co.'s wagon and carriage axle works, resumed work Monday, giving employment to about 100 men.

The Mackolite Fire Proofing Co. has added many men to its force since election day and finds that if orders continue to come in at the same rate of speed as at present, it will be compelled to operate the works day and night in the near future.

Heroy & Marrenner have put on a number of additional men and report a revival in their business of manufacturing and dealing in plate glass.

The Hill Cart & Carriage Co. has nearly doubled its force.

The Illinois Screw Co.'s business is rapidly on the increase, and new men are constantly being added.

Within the last week contracts have been awarded for the erection of a large number of cottages for the working men, as well as for a number of more pretentious dwellings. It is anticipated that these additional accommodations will be required at once for the increasing population drawn to Chicago Heights by the remarkable revival of the industrial activity, which is its chief element of prosperity.

The Chicago Heights Land Association closed a contract with a rolling mill about two months prior to the election, with the understanding that if McKinley was elected, the erection of a large plant at Chicago Heights would be commenced at once. This week the engineers and architects are at work on the plans and specifications of the buildings, and construction will begin early next week. The people connected with this enterprise are well known in the iron and steel trade, and for their own reasons they wish to avoid publicity until a few more details are arranged.

A HANGER 16x24 inches has been prepared by the Springfield Machine Tool Co., Springfield, O., to illustrate its lathes, shapers, power presses, and turret lathes. Fourteen different machines are shown covering a large range of service. Descriptive circulars will be sent on application giving details concerning any of the tools illustrated on the hanger.

T. J. BRAY has resigned as secretary and superintendent of the Ohio Tube Co., Warren, O., to engage in business in Pittsburg, John Baxter, his assistant, succeeds him as superintendent.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The Pittsburg Foundrymen's Association met by call of the president Monday evening, Nov. 30, at the Builders' Exchange. There were present: President Robt. Taylor, of Taylor, Wilson & Co.; Joseph S. Seaman, Seaman-Sleeth Co.; James Boyle, and Joseph McDonald, Westinghouse Electric Mfg. Co.; Wm. Yagle, Wm. Yagle & Co.; T. E. Malone, J. J. McCormick Co.; R. B. Lean, Crescent Foundry & Construction Co.; Wm. Altsman, Jas. Collord & Co.; Phillip Mathes, Brittain Graham & Mathes; Howard M. Wilson, Taylor, Wilson & Co.; Edward Kneeland, Frank-Kneeland Machine Co.; Andrew McRoberts, *American Manufacturer;* R. A. Walker, *Iron Age;* Jas. R. Mills, Jr., *The Iron Trade Review.* In the absence of Secretary Zimmers, R. B. Lean was chosen temporary secretary.

A business session preceded the discussion of the assigned subject, during which the executive committee reported on permanent quarters. Arrangements have been made whereby all meetings of the association will be held in the Builders' Exchange and members of the association are also tendered the freedom of the rooms at all times. The fourth Monday of each month was recommended as the time of meetings. The committee's recommendations were adopted.

The committee also reported favorably on the following applicants for membership and their election followed: Lincoln Foundry Co. and James Collord & Co., Pittsburg; Dawes & Myler, New Brighton, Pa.; McKeefrey & Co., Leetonia, O., and Jarecki Mfg. Co., Erie, Pa.

A communication from Detroit foundrymen was received, asking the co-operation of the Pittsburg association in securing for Detroit the next annual meeting of the American Foundrymen's Association. The secretary was requested to indicate the preference of the Pittsburg association as requested.

The president announced that owing to the short time given after securing quarters and fixing the date of meeting, no formal paper had been prepared, but that the "Use of Test Bars in Foundry Practice" would be discussed informally. By request, Mr. James Boyle opened the discussion giving his observations of the workings of Keep's machine for measuring the strength of cast iron. The workings of the machine were described in detail and various experiments cited. Questions by Mr. Wilson elicited the statement that light bars are more successful than heavy bars, but with reasonable care and uniformity in the routine followed, both are successful. Mr. Boyle was followed by Mr. Taylor, who urged that tests are indispensable to insure quality and to maintain the standard of foundry products. Mr. Seaman and Mr. Kneeland explained the difficulty of applying to chilled rolls and other heavy work the methods employed successfully in foundries whose products are gray iron and light castings. Questions as to the making of various dimensions of test bars, and as to methods of casting them were brought up and discussed by Messrs. Seaman, Yagle, Wilson, Kneeland, and Boyle. The views of a number of the foundrymen were given also, as to the fairness of a tensile test.

The meeting was an entire success and the discussions proved very interesting. The future of the association seems assured, the movement having awakened genuine enthusiasm. A number of applications for membership are in the hands of the executive committee for action, and will be voted upon at the next meeting.

CAPT. OLE M. LUND, of Christiana, Norway, a commissioned officer in the Norwegian army, is in this country on a tour of inspection among iron properties. While in Cleveland recently he investigated the methods of handling iron ores and later went to the Lake Superior region, visiting iron mines on the Vermilion, Mesabi, Marquette, and Menominee ranges. Capt. Lund represents iron mining capital in Sweden and his visit is to obtain information as to methods of working iron mines on this side.

RATES made effective Nov. 25 by the Southern Railway on pig iron from Birmingham, Chattanooga and Sheffield respectively are as follows: To Chicago, $3.65, $3.40, $3.40; to Detroit, $3.80, $3.30, $3.55; to St. Louis, $3.25, $3, $2.80; to Cincinnati, $2.75, $2.25, $2.50; to Louisville, $2.80, $2.25, $2.25.

SIR HENRY BESSEMER ON HIS PROCESS.

One of the notable papers at the meeting of the American Society of Mechanical Engineers in New York this week was that of Sir Henry Bessemer—a "Historical and Technical Sketch of the Origin of the Bessemer Process." Sir Henry is an honorary member of the society, and this contribution from him to its literature is no doubt prompted by the discussion that arose last year over his title to priority in the discovery of certain features of the Bessemer process. The paper was accompanied by numerous illustrations. One paragraph in the paper that will attract attention is the following relating to the much-discussed relation of Mushet's discovery to the successful application of the Bessemer process. In it Sir Henry refuses to concede the claim that is often made for Mushet:

"I may here call attention to the fact that in my patent dated October the 17th, 1855, I described how the state of carburation of the converted metal might be regulated by the addition of molten pig iron after the blow had taken place; and as this patent was dated 11 months prior to Mr. Mushet's patent, claiming to recarburize the converted metal with the German pig iron known as spiegeleisen, Mr. Mushet could not prevent my use of that, or any other pig iron, to recarburize the converted metal after the blow. There was also another absolute bar to Mr. Mushet's claims to the exclusive use of manganese in my process besides its public use in all countries by cast steel manufacturers, for in another patent of mine, dated May 31, 1856—that is, 16 weeks prior to either of Mr. Mushet's three manganese patents—I gave the right to the public to alloy steel in my process with any metals previously used to alloy cast steel, by showing various ways in which these alloys might be made in my process, either by fluid or solid metals, or by metallic oxides. After this description I entered a disclaimer to their exclusive use, by means of which disclaimer and publication, all alloys of steel might be made in my converting process which had hitherto been made by other cast steel manufacturers; so that the three patents of Mr. Mushet embracing, as they did, every known means of employing manganese, and which were intended to corner me and control my patent, utterly broke down simply by having been anticipated in my two former patents. In consequence of this, Mr. Mushet did not think it worth while even to give me notice that in using spiegeleisen for recarburizing I was infringing his patents, nor did he make any attempt legally or otherwise to prevent me and all my English licenses from the free use of manganese; and I could never understand why American steel manufacturers paid a royalty for the use of these invalid patents."

In conclusion Sir Henry makes this expression concerning the splendid achievements that are the legitimate development of his discoveries: "And now when I contemplate the great steel trade of Europe and America, with an annual production of 10,000,000 tons of Bessemer steel, I may be pardoned if I express some pride and satisfaction when I find that, notwithstanding the keen competition of rival manufacturers and the ceaseless activity and inventive talents of mechanical engineers, my original invention has not been swept away, but still exists in active operation in every steel making country in the world, intact in all its main features and in almost every detail as it left my hands forty years ago."

Another feature of the meeting was the address by President John Fritz on "Progress in the Manufacture of Iron and Steel in America and the Relation of the Engineer to It." The attendance was about 300. The following officers were elected for the ensuing year: President, W. R. Warner, of Cleveland; vice presidents, G. W. Melville, of Washington, D. C.; Charles H. Manning, of Manchester, N. H.; Francis W. Dean, of Boston; E. S. Cramp, of Philadelphia; S. T. Wellman, of Cleveland; W. F. Durfee, of New York; managers, John J. C. Kiefer, of New York; C. A. Bauer, of Springfield, O.; Arthur C. Wadsworth, of Boston; Morgan C. Stiles, of Middletown, Conn.; E. D. Meier, of St. Louis; G. W. Dickie, of San Francisco; H. S. Haines, of Atlanta; Gus. C. Henning, of New York; A. W. Robinson, of Milwaukee; treasurer, W. U. Wiley, of New York; secretary, F. R. Hutton.

Work has been resumed at the Fayal mine, from 300 to 350 men being employed. There is a stockpile of 100,000 tons.

A TWO-HUNDRED-FOOT GANTRY CRANE.*

BY JOHN W. SEAVER, CLEVELAND.

In the latter part of the year 1895, the Cambria Iron Co., of Johnstown, Pa., decided to construct a storage and loading yard for their proposed new structural mill at Johnstown, Pa., and invited several engineering firms to submit estimates and designs for a plant to handle the material that it was intended to store and load in this yard.

Among the firms invited to submit proposals, that with which the writer is connected took up the matter at once, and gave it a great deal of very careful study. The yard it was designed to cover—400x800 feet—was so large that it was evident from the beginning that unless some very economical form of construction should be proposed, the expense of covering the area would be very great. There are several methods by which the desired object can be attained, and each plan was carefully considered and its objections and advantages compared.

A very simple way of covering any area is by the use of stationary derricks with swinging jibs. This, while probably the cheapest construction, is at the same time the most objectionable, on account of its requiring a large number of derricks to cover the surface. In fact, swinging derricks cannot be arranged so as to cover the whole yard, as there is necessarily a considerable area around the foot of the derrick that is unavailable. These objections caused this plan to be dismissed.

The next plan that was considered was a system of surface tracks, between which the material to be stored would be piled, and on these tracks a number of locomotive cranes could be placed. Two of the objections against the plan of a stationary derrick system could very properly be raised against this second plan with even greater force, as the tracks upon which the locomotive cranes would travel would occupy a very large portion of the yard. The locomotive cranes would be very expensive, and their range of length of jib is quite limited.

A third form of construction, and one that seemed to offer several advantages over the first two plans, consisted in a series of overhead tracks, running parallel to the length of the yard, and, mounted on these tracks, were to be a number of overhead traveling cranes of the ordinary type. Against this plan could be urged the fact that the supports themselves would take up more or less room, and the foundations, columns and stringers for these supports would be very expensive, as it was proposed to make the cranes of exceptionally long span (100 feet centers of supports). This span would make the overhead ties or bracing very expensive.

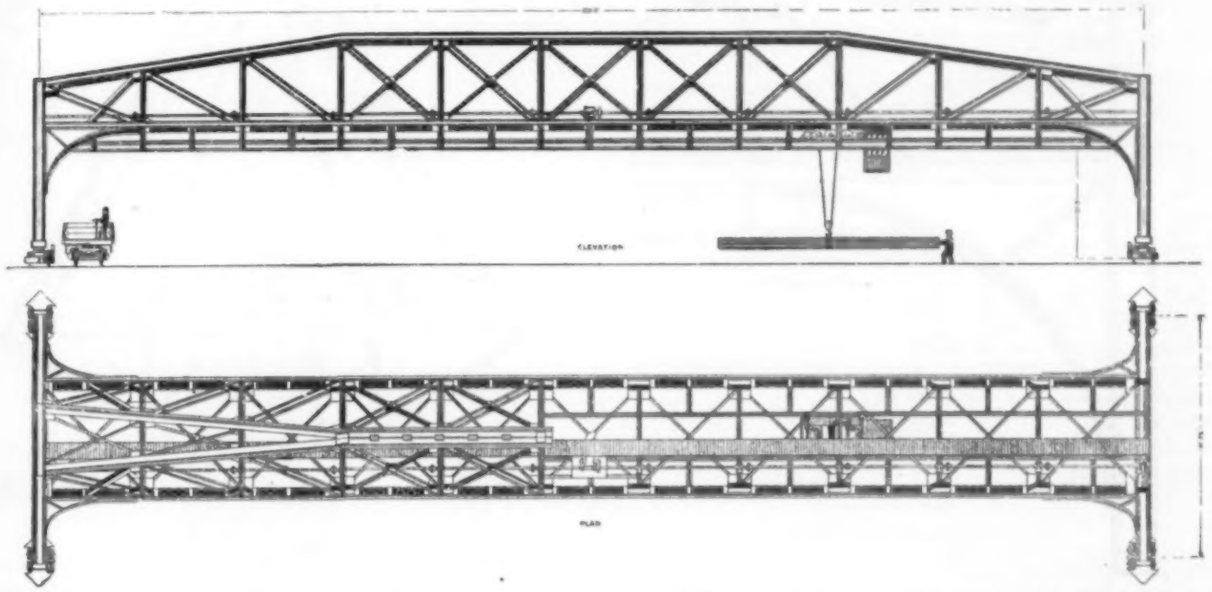
Dispensing with the overhead bracing would necessitate the columns supporting the overhead tracks to be sufficiently rigid in themselves to maintain the tracks in perfect alignment, and, in addition to this, they would require exceptionally heavy and good foundations and anchorages.

The cranes themselves would be expensive, and, should the surface of the whole yard be covered, which would necessitate four cranes, each 100 foot span, it would mean the employment of four operators—one for each crane.

These were the principal objections to the overhead crane system, but they were deemed sufficient to cause the rejection of this plan in favor of the Gantry crane system.

This plan contemplates the use of two traveling cranes, each 200 feet span, running upon tracks on the surface of the ground, parallel to the length of the yard, so that the two cranes cover the whole surface, with the exception of three spaces, one five feet wide down each outside edge of the yard, and one ten feet wide down the center. There is one line of track down each outside edge, and two lines of track down the center.

It was proposed to mount the cranes upon end frames or legs, making them what are commonly called "Gantry cranes," and to make the legs or end supports of sufficient height to allow a train of cars with men on top of same to pass freely underneath. For this purpose the clear height from the top of the rail to the underside of the stringer that the crane trolley traverses was fixed at 20 feet; and as the height from the surface of the yard to the top of the rail is 14½ inches, a clear height from the surface of the ground to the underside of the crane of 21 feet 2½ inches is obtained.



The magnitude of these proposed Gantries caused the matter to be most carefully considered, both by the Cambria Iron Co and the Wellman Seaver Engineering Co., who submitted this plan to them for their consideration. After a thorough examination of the plan proposed by them they were awarded the contract. The firm, before submitting their proposal for this crane, very carefully considered all the various forms of cranes, both of the regular traveling and the Gantry types that are at present in use, and, after a thorough investigation of the different types, decided upon a form of construction that they believe to be entirely original. It consists of two main girders of the Pratt type, with vertical posts and diagonal tension braces, the bottom chord being straight, and the top chord parallel to the bottom chord for about one-half of its length, and then inclining to the end posts at such an angle that the depth of truss at the ends is one-half that at the center. These two main trusses are framed together at an angle of 60 degrees. The top chords have their parallel portions connected with splice and tie plates. The bottom chords are parallel to each other, and separated a distance of 20 feet. The main trusses are 18 feet deep at center and nine feet deep at the ends.

This peculiar form of construction gives the arrangement of the main trusses the appearance of a steep-hipped roof, very long in proportion to its height. A cross section at the center is that of an equilateral triangle, and the cross section of any point between the end posts and where the top chords

* Read at the New York meeting of the American Soceity of Mechanical Engineers, Dec. 1-4, 1896.

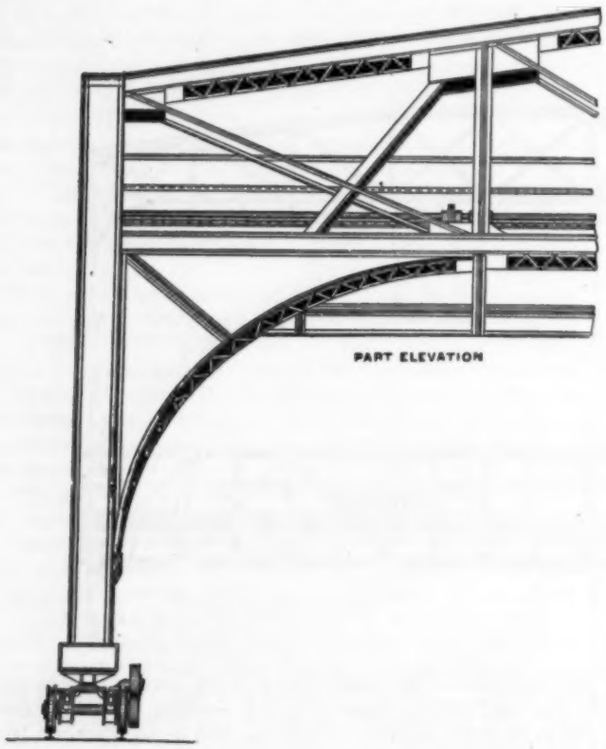
join each other is that of a trapezoid. Suspended beneath the bracing that separates the bottom chords is a runway for the crane trolley to travel on. This runway consists of rivited I-beams, with T-rails secured to their upper flanges. The stringers are very rigidly braced to the chords of the main trusses, not only at the panel points, where they were suspended, but also at the middle of each panel.

The horizontal bracing between the trusses consists of a series of floor beams, firmly riveted to the posts of the trusses, and forming the struts of the lateral system.

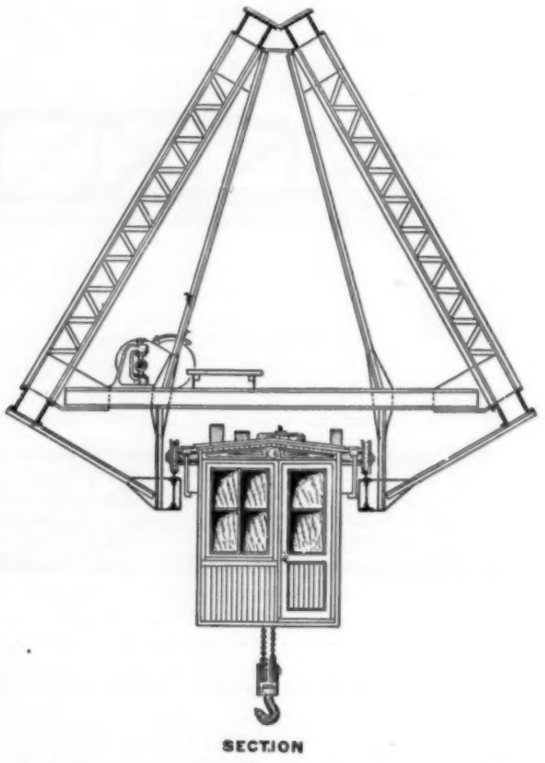
The diagonal members consist of angle irons rivited to wing plates secured to the trusses and floor beams, these wing plates being bent to conform to the angles of the floor system and the trusses.

To prevent any cross strains of the struts resulting from the live load (the weight of the stringers and trolley), it is taken directly from the stringer suspenders up to the top of the posts of the main trusses by means of diagonal suspender angles. These angles also form posts for the attachment of a line of hand-railing.

Resting on top of the floor beams are two lines of channel irons parallel to the main trusses. These channel irons form stringers for the foot walk, which extends the full length of



PART ELEVATION



SECTION

the crane. The walk is made of two thicknesses of pine plank with tar-paper between. The floor beams also carry the pillow-blocks for the main shafting. At the ends of the crane, and in the plane of the trusses, are carried down riveted legs, or supports of the box form. These legs are firmly braced to the bottom chords of the main trusses, with large plate iron brackets, well stiffened with angle iron flanges. The legs are also braced to each other crosswise of the crane, with a system of horizontal and diagonal braces, with a stiff tie-beam at the foot of the legs.

The width from center to center of the trucks supporting the crane is 43 feet nine and three-quarters inches, forming a wheel base for the crane of a little more than one-fifth of the span, which is sufficient to square the crane on the tracks.

The end frames are formed of plates and angles, arranged so as to present a smooth end surface, the corners of the openings being filled in with curves of large radii.

The top chords are made of two channel irons with a cover plate on top, and latticing on the bottom. The bottom chords are made of two channel irons, latticed on top and bottom, so as to afford no room for lodgment of moisture; this point being carefully kept in view throughout the construction.

The vertical posts of the trusses each consist of four angle irons latticed together. The diagonal members of the trusses are each formed of two angle irons rivited at their intersection. Particular care was paid to the connections of all members.

The loads and strains adopted for this crane were as follows: A live load for trolley equal to 20,000 pounds. To this was added, for impact, 25 per cent, or 5,000 pounds. The weight of the trolley was estimated at 23,000 pounds—making a total of 48,000 pounds distributed on four wheels, spaced about nine feet centers, bringing a reaction upon each stringer support of 18,000 pounds.

To still further provide for any sudden application of a live load, it was assumed to be equal to 22,000 pounds applied at any panel point of bottom chord of each truss. This is largely in excess of any load that will come upon the crane; but it was considered advisable to use it, in view of the fact that the load might catch, thereby bringing a greatly increased weight upon the trolley. The dead load, weight of trusses and floor, was assumed at 88,000 pounds per truss, or 8,000 at every point of bottom chord of each truss.

In order to provide for a very large factor of safety, in the bottom lateral system, a wind pressure of 20 pounds per square foot was assumed, or a load of 5,000 pounds at each panel point of bottom chord. To resist these combined loads, the following limitations of strains were adopted:

For live loads.	Tension.....	12,000 lbs.	per sq. in. of net section.
	Shear	6,000 "	" " " " " "
	Compression ...	10,000 "	of gross section.
Bearing on rivets and bolts.....		12,000 "	per sq. in.
For dead load.	Tension.....	15,000 "	" " " of net section.
	Shearing.....	10,000 "	" " " " " "
	Compression.....	12,000 "	" " " " " gross section.
Bearings on rivets and bolts.		15,000 "	" " " "

In all the compression members a proper reduction of the strains was made in all long members, so as to insure the same general factor of safety throughout, and the strains in the bottom lateral system were still further reduced to 10,000 pounds per square inch in tension and 8,000 pounds per square inch in compression. All of these strains are largely in excess of what the writer would recommend for an ordinary crane construction; but the ratio of dead load to live load is so great that it was necessary to observe the greatest possible economy of material to avoid the crane being so heavy that it would be impracticable.

The truss members were not all proportioned to comply exactly with the areas that the above limitations of strains called for. They were never made of less sections, and in several cases the section was increased in order to obtain the necessary stiffness. This will account for the seemingly

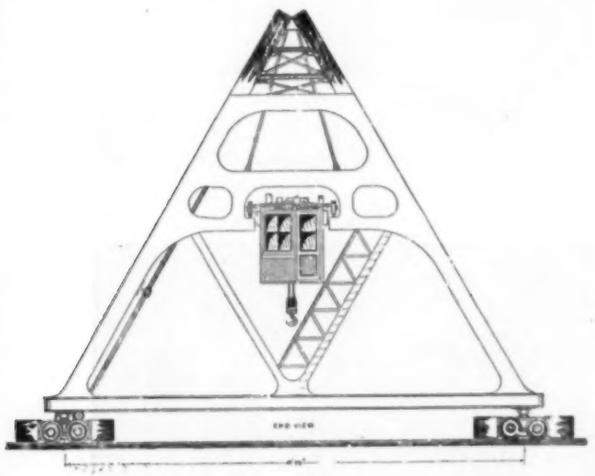
largely increased area of some of the members over that required by theory.

The minimum speeds of the various motions of the crane are as follows:

Traverse of main bridge	200	feet per minute.
" trolley	400	" " "
Hoist with full load	20	" " "

The crane rests upon four trucks; each having four steel tired double flange wheels, 24 inches in diameter. The wheels are keyed to steel axles, five inches in diameter. The gauge of the track is three feet six inches centers of rails. The journals are five inches in diameter, seven inches long, fitted with bronze bearings carried in cast steel oil-boxes, with ample provision for lubrication. The wheels on one truck at each end are connected by means of a system of shafts and bevelled gear wheels. The gear wheels are steel castings, and are of extra heavy design throughout. The shafting from one truck to the other is four inches in diameter. The couplings are all rigid flanged couplings, tightly keyed to the shafts, and fitted with turned bolts of a tight driving fit. The main shaft, extending the length of the crane, is carried in universal bearing pillow-blocks of very heavy design. These pillow-blocks are bolted to the cross beams of the floor system, with packing pieces between them and the beams, and are lined up perfectly true and level. The thickness of the packing pieces vary to suit the requirements of each individual pillow-block.

The end bearings, where the main shaft is geared to the diagonal shafts that connect it to the trucks at each end, are



carried by compound boxes, so that it is impossible for the main and angular shafts to get out of line.

Special care has been taken with all the bearings to provide ample facilities not only for the lubrication, but for the inspection and removal of any part. For most of the bearings, compression grease-cups have been supplied, in addition to the usual lubricating holes and reservoirs.

The top of each truck carries a steel socket or cup, and in this socket is placed a hard steel ball, six inches in diameter.

The bottom of the end supports are also provided with corresponding cupped sockets. The ball rests in a slightly elongated groove; the major diameter of the groove being crosswise to the center line of the truck, and the minor diameter being parallel to the track on which the truck rests. By means of this elongation of the groove, the ball is allowed a slight motion at right angles to the center line of the track on which the truck travels, and this permits of the expansion and contraction of the main girders of the crane. It also allows the trucks upon which the crane travels to be slightly out of alignment, as the balls form universal joints between the trucks and the crane.

The arrangement of the gearing connecting the driving shafts to the trucks is such that the vibrations of the trucks around the centers of the balls do not disturb the alignment of the gearing to an appreciable amount, as the centers of the main driving spur wheels are on the same lines as the centers of the balls. Directly in the center of the crane is placed a 50 horse power electric motor, connected directly to the main shaft with one reduction of steel gearing.

The trolley which travels upon the suspended runway beneath the main chord is of the ordinary crane type, with the exception that the gearing throughout is of extra heavy design, and of either steel or bronze castings. The winding-drum is of cast iron, with right and left-hand grooves for the chain, milled out of solid metal. The traversing of the trolley upon the track and the hoisting is done by two 25 horse power electric motors. All the motors are wound for 220 volts.

The operator's cage is attached to, and moves with, the trolley. It is provided with windows on all sides, so that the operator can have a clear view of any part of the yard. In the cage are placed the controllers which govern all the motions of the crane, and the necessary switches, cut-outs, etc. Over all the gearing is placed coverings or housings that are readily removable, the coverings being arranged to exclude all moisture of dust. The motors are also encased.

Attached to each truck are two snow-plows, or guards, made of plate stiffened with angle irons. These snow plows are easily removable, so that access can be had to any part of the trucks. The end frames are so arranged that should it be desired to transfer a load from one side of the yard to the other, both cranes can be brought in line with each other by means of removable stops on the trucks, and the trolley from either crane run directly through the end supports and on to the track on the other crane.

Estimates of Tin Plate Stocks.

Chas. S. Trench & Co., New York, give the following statistics and estimates on tin plate production and stocks for 1896:

	CWT. 112 LBS.
Estimated stocks in hands of dealers and mills in U. S., Jan. 1, 1896	420,000
American production for six months to June 30, Special Agent Ayer's report	1,637,526
Imports production for six months to June 30	1,361,338
	3,418,864
Estimated stock in U. S., June 30, 1896, Mills, 134,400 Dealers, 261,600	396,000
Apparent consumption for 6 months, Jan. 1 to June 30, 1896,	3,022,864

	JULY.	AUG.	SEPT.	OCT.
Estimated American production	209,500	270,400	323,900	343,200
Importations	240,330	231,324	183,500	178,660
	Actual.	Actual.	Estimated.	Estimated.
	449,830	501,724	507,400	521,860
Estimated stock, 1st each month	396,000	360,200	335,200	369,000
	845,830	861,924	842,600	890,860
Estimated consumption	485,630	526,724	473,600	504,460
Estimated stock end each month	360,200	335,200	369,000	386,400
Of which we estimate Mills held	124,000	91,600	105,500	123,900
Dealers "	236,200	243,600	263,500	262,500

The Harrisburg District.

The engine department employes of the Harrisburg Foundry & Machine Works are rushing work on a large engine to be shipped to Rio de Janeiro, Brazil. This engine is to be direct connected with a General Electric generator and will be placed in the official residence of the president of Brazil, to furnish power for electric lighting. It is wanted by the authorities by the holidays and cablegrams directing the hurrying of the work have been received.

The Columbia Rolling Mill Co., John Q. Denny, manager, Columbia, Pa., is having plans prepared for large improvements to the plant. Mr. Denny expects to fit up the mill with improved machinery which will increase the output and at the same time save labor.

H. Halbach & Son, Lebanon, Pa., will erect a large factory to manufacture bicycles, and will place new machinery of the latest improved pattern.

The Central Iron Works, Harrisburg, Pa., are now running double turn and prospects for the winter are very good.

The Anthracite Wagon Co., Harrisburg, Pa., has broken ground for a large three story brick addition to its plant, to meet the wants of its rapidly increasing trade.

The Harrisburg Mfg. & Boiler Co., Harrisburg, Pa., is making some repairs in its machine shop which necessitate the closing down of that department the balance of this week. The boiler department, as well as the foundry, is working on full time, with good orders on hand.

THE American Pig Iron Storage Warrant Co. had 196,800 tons of pig iron in yards Nov. 20, 4,000 tons having been withdrawn in the preceding ten days and 2,000 tons added.

NIAGARA POWER IN BUFFALO.

One minute after midnight on Nov. 16, with the closing of five sets of switches, the power from the cataract at Niagara was brought into the city of Buffalo. The history of the generating station of the Niagara Falls Power Co. is so well known that it will not be referred to here, beyond the statement that the three great two-phase generators are all in use furnishing power to the factories in and immediately around Niagara. The most recent addition to the power-house equipment is one of the General Electric Co.'s converters to take the two-phase current from the generators at 2,200 volts and turn direct current into the lines of two or three railroad companies at a pressure of from 575 volts to 600 volts.

The current from the falls is generated by the Niagara Falls Power Co., which transmits the power as far as the city limits of Buffalo. All the construction work in connection with this installation was done by the Cataract Construction Co., while the distribution, after it has reached the city limits, is in the hands of a sub-company, the Cataract Power & Conduit Co.

The two-phase current starting from the genreators in the power house is led first to the switch-board and then in lead-covered cables through the covered "Bridge of Sighs," which passes over the canal of the Niagara Falls Power Co., to a large transformer house which has been erected on the opposite side of the canal. Here the cables are connected to four switches on a blue marble switchboard. From this board, they pass to the step-up transformers, the largest in the world, erected on a platform at one end of the power-house and placed over an air-tight chamber. Each has a capacity of 935 k. w., or 1,250 h. p. and stands 94 inches high on a base 64x56 inches and weighs 25,000 lbs.

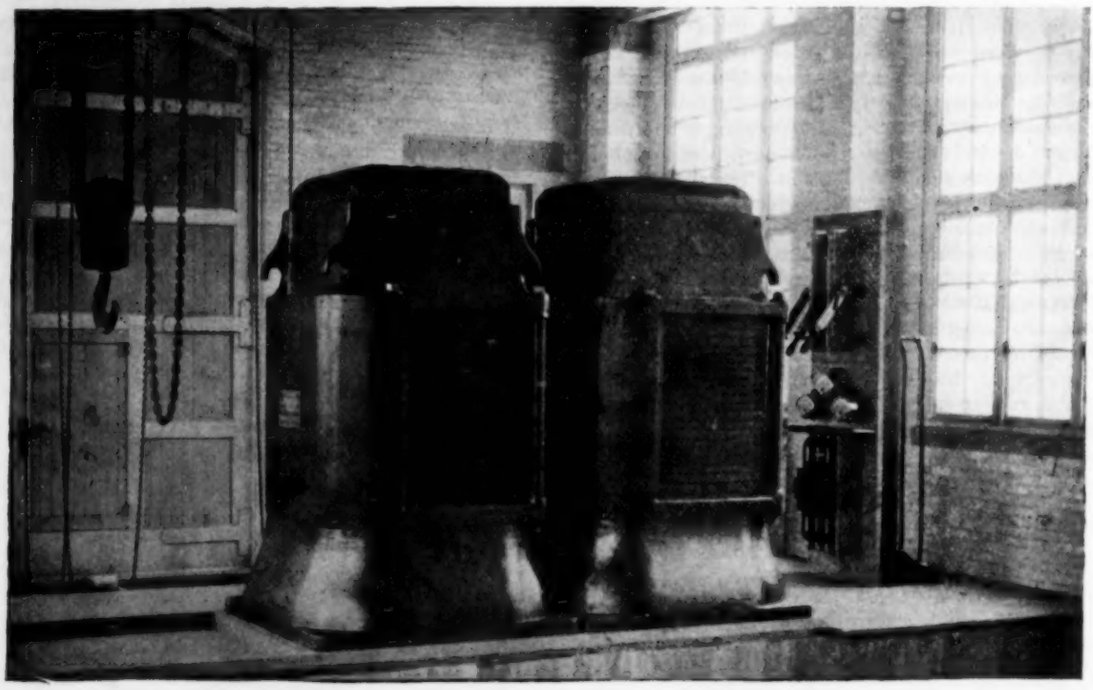


FIG. 1.—THE 1,250 H. P. STEP-UP TRANSFORMERS AT NIAGARA.

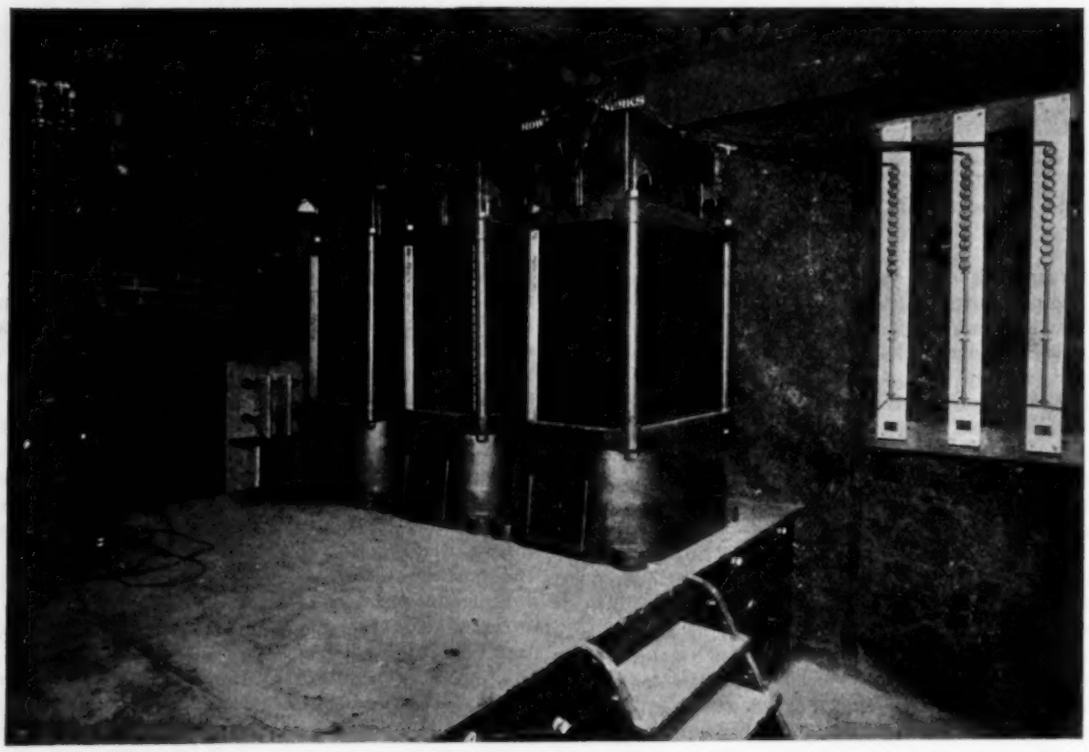


FIG. 2.—STEP-DOWN TRANSFORMERS AT BUFFALO.

The problem of cooling these transformers has been solved by driving a blast of cold air up through the air passages provided in the core and coils. The blast is furnished by a large blower driven by a 5-h. p. multipolar motor which is belted to it. It is in these transformers that the two-phase system is abandoned and the current given three phases, and raised from 2,200 volts alternating to 11,000 volts. Provision is also made in these transformers for raising the voltage to 22,000 volts as soon as higher pressure shall have become necessary. From the transformers three cables pass to the high tension switchboard standing beside them. This switchboard is also of marble and carries three high tension switches, each switch being separated by a marble barier about one inch thick. This partition prevents arcing from switch to switch at the high pressure used. The switchboard also carries current indicators and three special fuse carriers. From the transformer house, the wires pass through lightning arresters to the first pole of the pole line standing immediately in the rear of the building.

The pole line runs along one side of a special right of way 30 ft. wide. There are 21,000 poles ranging from 35 to 65 ft. in length and set about 75 ft. apart. Each pole is provided with two 12 ft. cross-arms for the transmission line, and one small cross arm for a telephone line. The capacity of each circuit is 5,000-h. p. at 11,000 volts pressure, and 10,000 h. p. at 22,000 volts pressure.

The length of the line is 26 miles. The overhead conductors are of bare stranded copper, each conductor having a diameter of 350,000 circular mills, and each lies in a groove at the apex of the insulators. When the line approaches the station at Buffalo, which it does along the banks of the Erie canal, it is charged from overhead to underground, the wires passing from the last pole into a small brick terminal house. In this house, connections are made with the unedrground cables through lightning arresters. The underground cable is rubber covered and sheathed with lead, and is of the same diameter as the overhead conductor. It is laid in a subway consisting of vitrified tile ducts, each duct having a hole three inches in diameter. The subway consists of 12 of these ducts, laid 18 inches below the surface of the ground, and surrounded on all sides by four inches of concrete. Three ducts only are in present use. The insulation of these cables was tested to withstand 80,000 volts.

The subway terminates in a small brick structure erected in the rear of the Niagara street power house of the Buffalo Railway Co. This contains the step-down transformers. On entering this small house, the wires are connected to another switchboard, carrying high voltage switches and fuse carriers separated by partitions of marble in the same manner as on the high tension switchboard at the Niagara Falls end of the transmission. From this board, cables are carried through lightning arresters to the transformers, of which there are three, two being in use, and the third being held in reserve. Each weighs 7,000 lbs., is 82 inches high, with a base measurement of 47x36 inches. In the step-down transformers, the pressure is reduced from 10,700 volts to 370.

From the step-down transformers, the three-phase current, divided into two circuits, passes over six cables to the main floor of the power house of the Buffalo Railway Co., where they are connected to another switchboard. Thence they pass to the two rotary converters, each of 500-h. p. capacity. These converters are six-pole machines, and in their operation, the three-phase alternating current at 370 volts is changed into direct current at 500 volts, suitable for delivery to the feeder line of the electric street railway. Each converter armiture is provided with three collector rings at one side and a commutator at the other, and may be started either by the alternating current or by direct current from the railway lines. The converters may be used in parallel with the other generators, or the current can be thrown directly into the feeders of the railway system.

The entire apparatus used in the transmission of the current from Niagara Falls to Buffalo is from the shops of the General Electric Co., having been designed especially for this service.

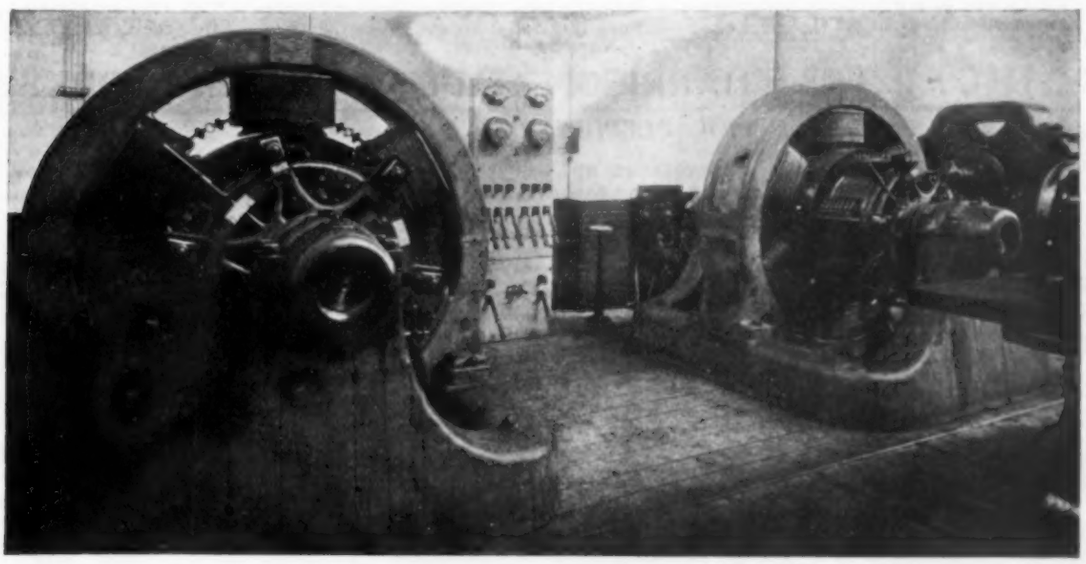


FIG. 3.—ROTARY CONVERTERS AT BUFFALO.

Work of the American Foundrymen's Association.

Secretary John A. Penton, of the American Foundrymen's Association, makes the following statement concerning its progress: "The organization now has a membership of over 200 and the number is rapidly increasing. More applications for membership have been received since Nov. 3 than during two months previously. The board of directors is now considering the advisability of putting into practical form some of the purposes for which the association was organized, among these being the adoption of a uniform apprenticeship system, to the end that its members may be protected in their efforts to improve the standard of American mechanics, in order that the present universal complaint concerning their scarcity may as far as possible be altered for the better. The board is also considering the advisability of adopting some measures for protecting the members of the association at all times from the unfair exactions of labor organizations as well as the attempt occasionally of one employer to take advantage of his competitors by reducing wages lower than the rest. The success attending the Stove Founders' Defense Association in this direction has served as an incentive, and it is almost certain that committees will be appointed to report on both of these projects at the next convention, which is likely to be held in the city of Detroit."

THE union molders of Cleveland have declared off their boycott on castings for the Brown Hoisting & Conveying Machine Co. The company was having its castings made without difficulty in non-union shops outside of Cleveland and the local molders decided that it was useless to attempt longer to deprive Cleveland foundries of the work.

THE COCHRANE HEATERS.

Can you conceive any better way of transmitting to water the heat in exhaust steam than by bringing this water and this exhaust steam into "ACTUAL CONTACT" with each other, without intervening surface of material of any kind? THERE IS NO BETTER WAY, and it can only be accomplished with an OPEN FEED-WATER HEATER.

If it were only possible to generate high pressure steam in this "actual contact" style, how long would you continue trying to pass the heat through the accumulation of non-conducting sediment—such as scale and soot—formed on one side or the other of the intervening heating surfaces which constitute the boiler? And would you keep on running the risk of trouble and loss due to leakage, repairs, etc.

Unfortunately the "actual contact" style is not possible in the case of boilers, but it does not change the fact that no better way ever has or ever will be devised for heating water by steam—and the beauty of this method is that IT WEARS WELL—it will be just as efficient, five, ten or FIFTY years from now as it was the first day.

Now, since *it is possible* in the case of Feed-Water Heaters, will it not be policy—good business policy—to use an OPEN HEATER with which you can get this "actual contact" without the coating of oil on the one side and the coating of scale on the other, that inevitably forms in Closed or Pressure Heaters? These coatings will stick to copper, brass, wrought iron, or any other metal, but they will not stick to a FILM OF STEAM. Have you ever examined the inside of a Closed or Pressure Heater after it had been in use some little time with bad water? It's an *object lesson!*

Some people say that exhaust steam cannot be so thoroughly purified from cylinder oil that this steam will be fit for bringing into contact with the feed water. *We differ with them.* They may know of dozens of cases where it wasn't done, but if they have not seen, or don't know what a Cochrane Oil Separator, with which every Cochrane Heater is equipped, can do, they ought not to decide too hastily. We are differing with them because we have carefully examined boilers after they have been run continuously, for periods ranging over five and six years, on condensed exhaust steam that had first been purified by the Cochrane Oil Separators—and of these independent oil separating appliances there are hundreds—seven, eight or nine hundred—we really do not know how many in operation, and our list of users includes some pretty well known concerns.

That's why so many of our customers who formerly used the other kind of Heaters tell us they are saving a large amount of fuel, can do the same work with one less boiler on, etc., since they began using the COCHRANE HEATER.

HARRISON SAFETY BOILER WORKS,

PHILADELPHIA, PA.

NEW YORK, N. Y.	PITTSBURG, PA.	BALTIMORE, MD.	ATLANTA, GA.	CHICAGO, ILL.	BOSTON, MASS.
F. E. Idell,	F. R. Drake & Co.,	Thos. K. Carey & Bros. Co.,	Chas. H. Wilcox,	A. Sorge, Jr.	A. L. McClurg,
26 Cortlandt Street.	Lewis Block.	26 Light Street.	35 N. Prior Street.	1533 Marquette Bldg.	19 Pearl Street.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

Marshal Rolling Mill Co. has been incorporated at Chicago, with a capital stock of $50,000, to operate rolling mills; incorporators: Herbert S. Duncombe, Charles A. Butler, and Robert C. McManus.

H. C. McCullough, and W. F. McLane, two New Castle, Pa., machinists, are about to locate a machine shop at Slippery Rock, Pa.

The New England Steel Co., Camden, N. J., has been incorporated with a capital stock of $100,000 to manufacture iron castings and to deal in iron and steel. The incorporators are Henry T. Kent, W. C. Henderson, N. S. Keay and Aaron Hamburger, of Philadelphia; H. A. Williams, of Massachusetts, and George W. Ring, of East Orange.

The Structural Steel & Iron Co., of Portsmouth, O., has been organized and will begin the manufacture of bridge work and other heavy structures. It has ample capital and already has contracts booked.

The Cameron & Barkley Co., Charleston, S. C., is in the market for prices on second-hand plain slide-valve engine, cylinders 18, 19 or 20x24 to 30, without the flywheel.

Chunn & Traxel, Maysville, Ky., will buy equipment for machine shop.

The Eagle Crucible Steel Co., Canton, O., just incorporated, is in the market for a second-hand hammer. Nothing less than a 2,000-pound hammer will answer, though it is possible a 700-pound hammer will be needed also.

"G," care the Chicago office of *The Iron Trade Review*, 1142 Monadnock Block, wants to buy an air compressor with capacity for about 100 feet per minute, for driving pneumatic tools, and one with capacity for 400 feet per minute for driving a rock drill.

New Construction:—

The Berlin Iron Bridge Co., of East Berlin, Conn., is putting up a new machine and blacksmith shop for the Robert Palmer & Son Shipbuilding Co., of Noank, Conn. The same company is furnishing a rolling mill for the Rome Brass & Copper Co., of Rome, N. Y., an iron roof for the new armory at Rutherford, N. J., and a new power house for the Plattsburgh Light, Heat & Power Co., of Plattsburgh, N. Y.

The W. Dewees Wood Co., McKeesport, Pa., has cleared a large plot of ground adjacent to its plant, on which it is building a large warehouse for storing finished product.

The Norwalk Iron Works Co., of Norwalk, Conn., has purchased a large tract of land and will erect a machine shop 80x300 feet, one story high, which will be connected with the present factory.

Z. W. Hood & Son, are building a foundry and machine shop at Harmony Grove, Ga.

The Bridgeford Foundry Co., W. L. Bridgeford, will erect a new plant at Louisville, Ky.

Additions, Enlargements, Removals, Etc.:—

The Baltimore & Ohio Railroad Co. will remove its repair shops to Keyser, W. Va., that town having raised the sum of $10,000. Bids will be received for the erection of the buildings and work will be commenced at an early date. At present only repair work will be done in the shops, but it is believed that ultimately new cars will be built there. The dimensions of the buildings will be 90x500 feet.

The Slaymaker Barry Co., which is building a lock works at Connellsville, Pa., is preparing plans and receiving bids for the erection of an addition to the works in the shape of an iron foundry for the purpose of making all its metal castings, which it has hitherto bought in the market. The foundry will be of brick.

The Friction Pulley Co., of Sandy Hill, N. Y., is building an addition to the machine shop, 104x40 feet, two stories, and a foundry addition 30x40 feet.

The Newport News (Va.) Shipbuilding & Dry Dock Co. will build an addition to its machine shop, 200x100 feet, steel and brick.

J. W. Penney & Son, founders and machinists, Mechanic Falls, Me., are building an addition to their machine shop.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ⁂ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Alleganv County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa., Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

DUCTILE CAST IRON

TENSILE STRENGTH, 60,000 TO 80,000 LBS.

Homogeneous, Clean and Solid. Suitable for Car Couplers and Knuckles; Crank Shaft and Gearing.

MADE FROM 10 TO 10,000 Lbs. IN WEIGHT. ESPECIALLY ADAPTED FOR

Electrical Work because of its Superior Conductivity.

MADE ONLY BY

EAST CHICAGO FOUNDRY CO., 716 THE ROOKERY, CHICAGO.

Subscribe for the Iron Trade Review, $3 per year.

EDWARD E. ERIKSON,

CONSULTING AND CONTRACTING ENGINEER.

Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers, Structural Iron and Steel.

Automatic Billet Heating Furnaces. Plans and estimates furnished.

CONESTOGA BLDG., PITTSBURG, PA.

Stowe, Fuller & Co.

WESTERN AGENTS OF

Mount Savage and Queen's Run Fire Brick

The leading BRICK of this country.

MANUFACTURERS OF

OHIO FIRE BRICK. ALL SHAPES IN STOCK

The largest shippers of FIRE BRICK in the West

Warehouse and Docks: 185-193 Merwin Street,

CLEVELAND, OHIO.

THE SARGENT COMPANY.

OLD COLONY BLD'G. CHICAGO ILL. U.S.A.

ST. PAUL, TACOMA, PORTLAND. ST. LOUIS, CINCINNATI, SAN FRANCISCO.

OPENHEARTH STEEL CRUCIBLE CASTINGS.

The Penn Steel Casting Co., of Chester, Pa., is making some important improvements at its plant. The shops will be among the largest in the State when the work is completed.

It is stated plans have been completed for the enlargement of the Louisville & Nashville Railroad Co.'s shops at Decatur, Ala. A. Beckert is master mechanic, New Decatur.

The Missouri Malleable Iron Co., of East St. Louis, has broken ground for an addition to its annealing room, and intends putting in enough additional ovens to increase the capacity one-third. The company expects also to have to increase other departments the coming winter. It has closed another contract with the Trojan Car Coupler Co. for from 35,000 to 50,000 "Trojan" couplers.

The Harrison Safety Boiler Works, Philadelphia, is occupying the new addition to its works. It is of brick, 78x75x40 feet. This is divided into an erecting shop for feed water heaters 78x40, one story, and a three-story machine and pattern shop, 78x35. The addition will materially increase the facilities for turning out feed water heaters and purifiers and separators.

General Industrial Notes:—

The tinning department of the new plant of the Connellsville Sheet Iron & Tin Plate Co., at South Connellsville, Pa., has been put in operation and the concern has already entered quite a number of orders. While the plant is equipped with a sheet mill, the company for the present will buy its black plate in the open market.

The plant of the Columbia Spring Co., at Hammond, Ind., resumed full operations Nov. 24, after having been running on an average of two days a week since last February.

A meeting of the stockholders of the Sterling Steel Co. will be held in its offices in the Westinghouse bldg., Pittsburg, Jan. 19, 1897, for the purpose of voting for or against an increase in the capital stock.

The New Castle Wire Nail Co., New Castle, Pa., has started up its rod mill to supply its own needs and hopes conditions will be such as to allow them to run continuously.

Among numerous contracts which the Berlin Iron Bridge Co. has secured of late for steel roofs covered with corrugated iron lined with its patent anti-condensation roof lining, is the roof for the new power station for the Stamford Gas &

U. BAIRD MACHINERY CO.

PITTSBURG, PA.

Have a Special Lot of Second-Hand Tools. All in First-Class Condition.

1—55″ Allen Riveter.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
1—16x18″ Lathe & Morse Crank Planer.
2—15″ Hendey Shapers.
1—15″ Youngson Shaper.
1—15″ Smith and Mills Shaper.
1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
1—16x5 ft. Bullard Engine Lathe.
1—18x8 ft. L. W. Pond Engine Lathe.
1—24x8 ft. Phillips Engine Lathe.
1—24x14 ft. Lathe & Morse Engine Lathe.
1—38x14 ft. New Haven Engine Lathe.

AND MANY OTHERS.

We have all the best makes of New Tools. Send for Second-Hand List.

ATWOOD & M'CAFFREY,

Brass Founders, Iron Pipe Fitters and Machinists,

MANUFACTURERS OF AND DEALERS IN

All Kinds of Pipe, Globe and Gate Valves, Fittings and Appliances for Steam, Gas, Water and Hydraulic Work.

Phosphor Bronze ("Elephant Brand") Castings, Coolers, Tuyeres and Cinder Notches for Blast Furnaces supplied promptly.

Rolling Mills, Steel Works, Blast Furnaces Coal and Coke Works, Power Houses for Electric Street Railways, etc., promptly fitted up by Experienced Workmen.

AIKEN Duplex and CRITCHLOW Valves, either three or four way, for operating Mill and Hydraulic Machinery of all kinds under any desired pressure, and Stop Valves for same.

Agents for the CAMERON STEAM PUMP, which is made in every possible variety, and suitable for all purposes to which Steam Pumps can be applied.

Nos. 108 to 118 Third Avenue, PITTSBURGH, PA.

Electric Co., at Stamford, Conn. The layout of this station is very convenient, and the construction is to be the best. The engine and dynamo room is 60 feet wide and 100 feet long, and the boiler room adjoining is 40 feet wide and 75 feet long. The walls are of brick, and the framework of the roof as well as the supports for the traveling crane in the engine and dynamo room are of steel. The Berlin Co. has the contract for furnishing and erecting all of the structural steel work.

John P. Brennan, formerly connected in an official capacity with the McClure Coke Co., has recently purchased a large tract of coal land in the Connellsville region, and will erect a number of ovens in the near future.

The plant of the Columbus Bolt Co., Columbus, O., which has been operated to only partial capacity for some time, is now running full in all departments.

C. K. Crain, J. J. Hoppes, and Charles Constantine are a committee of the Board of Trade of Springfield, O., to look into the question of starting the East Street Rolling Mills and possibly adding an open-hearth steel furnace.

The Buffalo Forge Co., Buffalo, N. Y., has recently been awarded a contract for two 15x15 Buffalo center-crank automatic horizontal class "A" engines to be direct connectd to card generators for the Lakeside Hospital, Cincinnati. The plant also involves the use of an 8x8 engine for belt connection to smaller dynamo.

A verdict was reached Nov. 17, at New Philadelphia, O., in the suit of the Wrought Iron Bridge Co., Canton, O., against J. B. Clow & Sons, of Newcomerstown, O., and Chicago. The suit was brought to recover judgment for over $13,000 and interest due it for building the iron frame work for the pipe foundry building at Newcomerstown. The defendant claimed $20,000 damages by reason of the Bridge company not completing its contract by the time specified in the contract. After hearing the testimony the court directed the jury to bring in a verdict for the Bridge company for the full amount of its claim, which was done, the verdict being for $14,223.15.

A plant has been secured at Beaver Falls, Pa., by the Roberts Steel Chain Belting Co. of Pittsburg, in which sprocket chain will be manufactured.

The Arctic Machine Mfg. Co., Cleveland, was placed in the hands of a receiver Nov. 25, on the application of Frank Wilson, who owns a considerable portion of the stock. The application says that the company has been established for 15 years and has a capital stock of $100,000 and an indebtedness of $60,000. The money stringency has made it impossible to get accommodations and $12,000 of indebtedness is overdue. It is probable that the company will be reorganized.

Frazer & Chalmers, Chicago, have received an order from Honolulu for pumping engines for the Ewa plantation. The order is for two pumps, each of a capacity of 10,000,000 gallons in 23 hours. One is a duplex double-acting Reidler pump, plungers 14½ inches diameter by 42-inch stroke, driven by a horizontal cross-compound condensing Corliss engine, steam cylinders, 24x38 inches diameter, by 42-inch stroke, capacity, 7,225 gallons per minute against a head of 197 feet, when running about 70 revolutions per minute. The other pump is similar, except that the head will be 120 feet, pump plunger 15¾ inches diameter and steam cylinder, 20x32 inches respectively.

The Franklin Steel Casting Co. has shipped to New York, to go to Russia, on account of the engineering company in the United States which is building a plant at Nijni-Novgorod, a plunger weighing 33,000 pounds. The test proved the metal to be of the highest order, 73,000 tensile strength, 38,000 elastic limit, with 25 per cent elongation in two-inch section and 21 per cent reduction of area. The company is making two large castings for the U. S. Navy. One is soon to be tested by the government, and if successful ten more are promised.

The Ohio Iron Co.'s mills at Zanesville, O., shut down Nov. 23, for lack of orders.

The Ohio Falls Car Mfg. Co., Jeffersonville, Ind., has resumed with 400 men and will increase this force considerably before Jan. 1.

Car building: The Columbus, Hocking Valley & Toledo has ordered 50 dump cars. Atlantic & Pacific is expected to increase its equipment. Wisconsin Central receivers have authority to buy 1,000 cars. The St. Louis & San Francisco will soon buy 300 or 400 coal cars. Contracts for 1,000 cars will be given out by private roads operating over the B. & O. Lebanon Mfg. Co., Lebanon, Pa., is completing an order for 500 hopper bottom cars. The Illinois Central has placed a further order of 1,000 cars, making 3,890 in 1896.

Geo. P. Millns, for a number of years connected with the Cleveland Facing Mills, Cleveland, as president and general manager, has organized the Geo. P. Millns Foundry Facing Co., of Cleveland and opened a warehouse at the junction of

Hamilton st., and the C. & P. R. R., Cleveland. Foundry supplies, foundry facings and plumbago will be handled, and the company will manufacture the "G. P. M. founders' perfect wash," originally invented by Mr. Millus.

T. H. Brooks was appointed receiver on Nov. 28 for the Phoenix Iron Works Co., Cleveland, manufacturers of foundry cranes. The company has been doing a good business, but trouble has arisen over recent complications in the affairs of John J. Shipherd, president of the company. The receivership is on the application of Mr. Shipherd.

The Michigan Malleable Iron Co., Detroit, Mich., which had been employing a reduced force is now giving work to nearly 300, over 100 being added in November.

The Woodstock Iron Co., will blow in one of its furnaces at Anniston, Ala.

At Newport, Ky., the Addyston Pipe & Steel Co. is employing 125 men after a long shut-down.

W. W. Smith and J. W. Reese, Nashville, Tenn., are negotiating for the purchase of the Paducah, Ky., blast furnace.

It is reported that T. T. Hillman, of Birmingham, Ala., contemplates improving and rebuilding the Gadsden, Ala., plant to a capacity of 180 tons daily; capacity now, 125 tons.

The Chicago Horse Shoe Co. has started up its plant at East Chicago, with a full force of men after a shut-down of one year. The company was recently reorganized with Gideon Calib as president, and the capital stock increased to $100,000. Extensive improvements have been made in the plant.

The Cambria Iron Co., Johnstown, Pa., which begun the erection of a beam mill six months ago, is now pushing the work, and the mill will be running in a few weeks, when it will be in the market for the sale of all sizes of steel I-beams, in connection with the other structural products of the works. The company is also increasing its open-hearth plant, so that the product of open-hearth steel will be much larger than heretofore.

THE date for holding the second annual convention of the National Association of Manufacturers, has been fixed for the 26th, 27th and 28th of January, 1897, at Philadelphia, Pa. It is expected that this convention will be one of unusual interest, as President Search will submit a report of the first full year of practical work on the lines mapped out by the original convention held in Cincinnati, in January, 1895. This report will describe the initiation of practical movement in the direction of the cardinal principles originally adopted by the association, and gratifying progress in various directions will be noted. It will then devolve upon the convention itself, to pass upon the work which has been done, and to indicate a policy to be pursued by the president and executive committee during the next year. It is confidently expected that conditions in 1897 will enable the association to make vigorous progress.

Winter Resort Excursions.

California and the West, Florida and the South.—Ask passenger and ticket agents of the Pennsylvania lines about the low rate, first-class service and quick time over this reliable route. Full information free. It will pay to investigate if you contemplate a trip. If not convenient to communicate with local representatives of the Pennsylvania lines near your home, address F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburgh, Pa., for desired information on the subject.

THE firm of McGregor & Jackson, manufacturers of boilers and saw mill machinery, Saginaw, Mich., has been dissolved. James McGregor having sold his interest in the property and business to Edgar D. Church. The business will be continued by John L. Jackson and Edgar D. Church, under the firm name of Jackson & Church.

Home Seekers' Excursions West and South.

Apply to nearest passenger or ticket agent of Pennsylvania lines for any desired information on the subject, or address F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburg, Pa. Low rates open to all.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

"Hoisting, Crushing and Mining Machinery"

EARLE C. BACON,

ENGINEER,

Havemeyer Building, New York.

WORKS:

Farrel Foundry & Machine Co. and Pacific Iron Works.

BACON'S

HOISTING ENGINES

For Every Possible Duty.

MINE CARS, SKIPS and MINE EQUIPMENT.

"FARREL'S" (Blake Pattern)

ORE AND ROCK CRUSHERS

AND

HIGH SPEED OR GEARED CRUSHING ROLLS

COMPLETE HOISTING, CRUSHING AND MINING PLANTS OUR SPECIALTY FOR OVER 20 YEARS, AND IN USE IN ALL PARTS OF THE WORLD.

Send for our Completely Illustrated Catalogues.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

..'96 JENKINS '96..

Is the Perfection of Joint Packing. Instantaneous. Does not Squeeze Out and not Necessary to follow up Joint. We guarantee it to last for years on any and all pressures of steam or any kind of joint where packing is required. Does not Rot, Burn or Blow Out, therefore the best for all purposes. Call for and insist on having '96 JENKINS '96 stamped like cut.

Jenkins Bros., New York, Boston, Philadelphia Chicago.

THE FINISHED STEEL CO

YOUNGSTOWN, OHIO

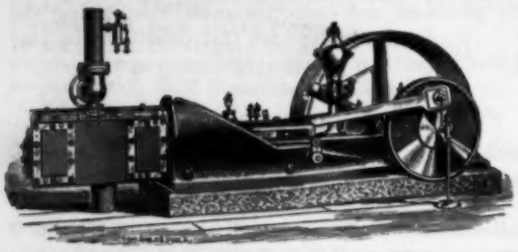
MFR'S OF **POLISHED SHAFTING**

SOUTHWARK FOUNDRY & MACHINE CO.

PHILADELPHIA, PA.,

SOLE MAKERS OF THE

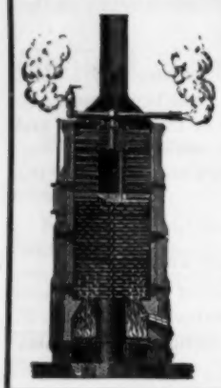
PORTER-ALLEN AUTOMATIC ENGINE.



FEATURES OF THIS ENGINE
Simplicity of Design,
Highest Economy of Steam,
Close Regulation of Speed,
Minimum Floor Space.

ALSO BUILDERS OF
Blowing and Reversing Engines,
Water Works Pumping Engines,
Centrifugal Pumps and Weiss
Counter-Current Condensers.

The Great Coal Saver and Producer of Dry Steam.



THE HAZELTON OR PORCUPINE BOILER.

THE PIONEER VERTICAL WATER-TUBE BOILER
. . OF THE WORLD. . .

16 Years' Unequalled Record for Economy, Safety and Durability.

No Explosions or Accidents of Any Kind.

CORRESPONDENCE SOLICITED.

THE HAZELTON BOILER CO.,

SOLE PROPRIETORS AND MANUFACTURERS,

Telephone 1229, 18th St. N. Y. GENERAL OFFICE:
Cable Address, "Palia," N. Y 716 East 13th St., NEW YORK, U. S. A.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

S. FREEMAN & SONS MFG. CO.,

11 Bridge St., RACINE, WIS.

MANUFACTURERS OF

Standard Tubular, Fire Box, Vertical and Submerged Tube Steel

BOILERS.

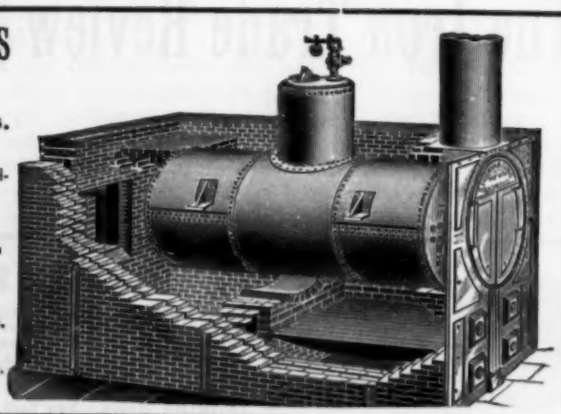
For Stationary, Portable, or Marine use.

Also of TANKS of all kinds.

Smokestacks, etc.,

Grey Iron Castings.

Write for Prices and Terms.



Being in the boiler business

For a long time,

We have learned that **HEATING SURFACE** does not always mean **HORSE POWER;**

It depends upon getting the HEAT to the SURFACE.

We have also learned that the only way to make a HIGH GRADE article, and sell it for about the same price as an ordinary one, is to concentrate our WHOLE PLANT and ENERGIES upon ONE ARTICLE—

THE TUBULAR STEAM BOILER.

Write us for Prices and Specifications. You need not unload the goods off the car if not as represented.

FULTON STEAM BOILER WKS. & FDY.
Richmond, Ind.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore. Pig Iron AND METALS.

Cleveland - Ohio.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.

Cleveland, Ohio, U. S. A.

THE BOURNE-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,

LAKE SUPERIOR IRON ORES.

— AGENTS —

The Spanish-American Iron Co.,
Santiago, Cuba.

CLEVELAND. PHILADELPHIA.

$2.50 CLEVELAND TO BUFFALO.

DAILY LINE BETWEEN

Cleveland and Toledo,

Via "C. & B. LINE."

Steamers "City of Buffalo," (new) "State of Ohio" and "State of New York."

DAILY TIME TABLE.

Sunday included after May 30.

Lv. Cleveland, 7:30 P. M.	Lv. Buffalo, 7:30 P. M.
Ar. Buffalo, 7:30 A. M.	Ar. Cleveland, 7:30 A. M.

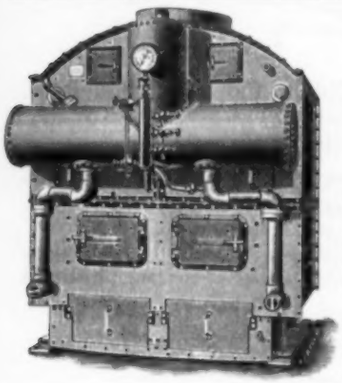
CENTRAL STANDARD TIME.

Take the "C. & B. Line" steamers and enjoy a refreshing night's rest when enroute to Buffalo, Niagara Falls, Toronto, New York, Boston, Albany, 1,000 Islands, or any Eastern or Canadian point.

Cheap Excursions Weekly to Niagara Falls.

Send 4 cents postage for tourist pamphlet.
For further information ask your nearest Coupon Ticket Agent, or address

W. F. HERMAN, Gen'l Pass. Agt. T. F. NEWMAN, Gen'l Manager.
Cleveland, O.



. . . ALMY'S . . .

PATENT SECTIONAL WATER TUBE BOILERS

FOR

Steamships, River Steamers, both propellers and stern wheels, Torpedo Boats, Fire Boats Yachts and Launches, Donkey Boilers for Steamships, and for all kinds of Stationary Work.

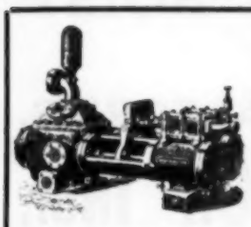
This Boiler possesses more advantages than any other Boiler.

It has STOOD THE TEST of over seven years' constant daily use in passenger steamers, and is in use in many of the best steam yachts. It has proved its durability to be equalled by none. It has shown from 10 to 15 per cent saving in every day work over the best Marine Fire-Tube Boiler.

It is one-third the weight of the Scotch Boiler for the same power and efficiency. It is non-explosive No priming, and easy to manage.

ALMY WATER TUBE BOILER CO.,

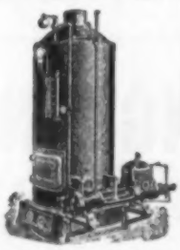
178-184 Allen's Ave., near Rhodes St., PROVIDENCE, R. I.



WORTHINGTON

STEAM. . .

PUMPS. . .



HENRY R. WORTHINGTON,

Send for Catalogue. NEW YORK.

Boston. Philadelphia. Chicago. Cleveland. St. Louis. Indianapolis. Detroit. Atlanta.

TRIPLEX PUMPS.

Four Types and Eight Sizes for ELECTRIC AND OTHER POWER.
SINGLE AND DOUBLE-ACTING CYLINDERS.

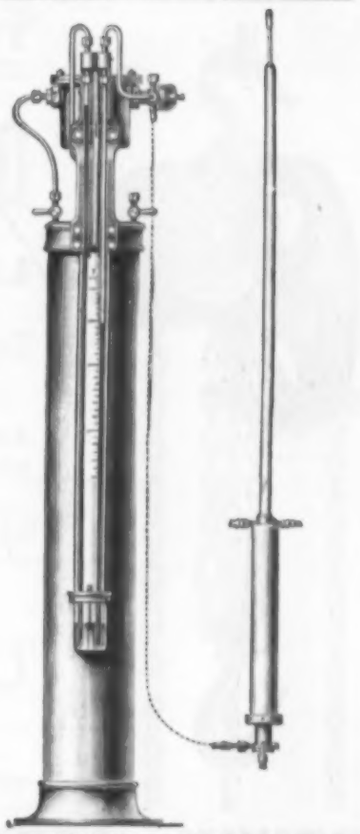
Unequaled in Design and Construction.

Adapted for Water Works, Hydraulic Elevators, Boiler Feeding, Apartment Houses, Mine Pumping, Irrigation, Paper Mills, Refineries, Breweries, Etc.

Made by THE DEMING CO., SALEM, O.

Gen'l Western Agts., HENION & HUBBELL, 61-69 N. Jefferson St., Chicago.

Subscribe for the Iron Trade Review, $3 per year.



THE PNEUMATIC PYROMETER.

Stationary and Portable.

SENSITIVE, ACCURATE AND DURABLE TO

3,000 DEGREES.

Uehling, Steinbart & Co., Ltd.,

64 Mulberry Street,

NEWARK, N. J.

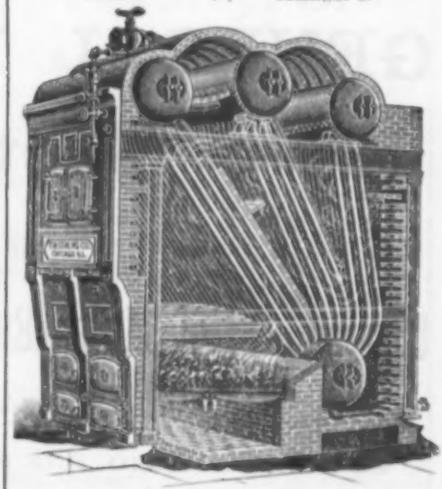
IT PAYS TO ADVERTISE IN

THE IRON TRADE REVIEW.

Stirling WATER TUBE Boiler.

SAFE, ECONOMICAL, DURABLE.

Over 350,000 H. P. In use. || Write for Catalogue I.



THE STIRLING CO.,

General Offices, Pullman Bldg., CHICAGO, ILL.

Branches in all Principal Cities.

THE HARRINGTON.....

DOUBLE CHAIN SCREW HOIST

LEADS THEM ALL!

The most popular hoist now made. Manufactured only in Philadelphia.

These Hoists are everywhere recognized as the standard. Adopted by the United States Government and in use in all first-class shops, rolling mills and manufactories.

They are safer and more durable than any other hoists. They have independent working chains, and the load being carried on two distinct chains instead of one, the possibility of accident is greatly reduced.

Capacity, 500 to 20,000 pounds.

OUR QUICK-GEARED HOIST

Specially adapted for Quick Work

☞ SEND FOR PRICE LIST. **IN ICE FACTORIES.**

EDWIN HARRINGTON, SON & CO., INC.,

DESIGNERS AND MANUFACTURERS OF

ENGINE LATHES, DRILLS, PLANERS, ETC.

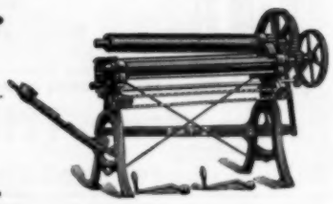
1526 PENNA. AVENUE, - - - - - PHILADELPHIA, PA.

Machines for Working Sheet Metal

Patent Gap Shears.

General Purpose Punch and Shear—seven sizes.
General Purpose Forming Rolls—all sizes.
Tools for Boiler Shops, Machine Shops and general iron manufacturing industries.
Address

BERTSCH & CO., Cambridge City, Ind.



GENERAL ELECTRIC COMPANY

Electrical Apparatus

FOR THE ECONOMICAL OPERATION OF

Iron and Steel Mills, Engine Shops, Factories of all kinds, Mines, etc.

WATER-POWERS UTILIZED.

ESTIMATES AND PRICES ON APPLICATION.

Main Office, SCHENECTADY, N. Y.

Sales Offices in all large Cities in United States. Foreign Department, 44 Broad Street, New York.

Manufacturers

Don't continue in the old rut and rust out.
Be progressive—keep in touch with the times.

Move to Chicago Heights

where you can reduce the cost of production and cheaply distribute the product of the factory to the consumer.

Free Factory Sites.

Cheap Fuel.

Chicago Freight Rates.

Free Water.

Free Switching Facilities.

Write to us to-day for full information.

CHICAGO HEIGHTS LAND ASSOCIATION,

THE LARGEST REAL ESTATE FIRM IN AMERICA.

Capital Paid in $1,250,000.00.

General Offices, 172 Washington Street,

Corner Fifth Avenue. **CHICAGO.**

The Kellogg Weldless Tube Co.,

MANUFACTURERS OF

Seamless Steel Tubes,

Findlay, O.

For Hydraulic Tubes, Jacks, Presses and Hoists, Lathe Spindles, Bicycle Hub Stock Projectiles, Hollow Shafting, Shells for Carbonic Acid and other Gases, Piston and Valve Rods, Axles, Bolts and Columns, Working Barrels, Roller Bearings, Bushings, Couplings, Boiler Tubes and other purposes where

Strength, Uniformity and Durability

ARE REQUIRED.

Our tubes are hot drawn, without weld or seam; from the best quality of steel, in lengths from 8 to 25 feet, and of any degree of hardness, from .08 to .60 carbon —They are equal in every respect, except finish, to cold drawn tubes and are offered at a much lower price.

For special work, requiring extremely low sulphur and phosphorus, we are prepared to guarantee a maximum of

.020 SULPHUR and .015 PHOSPHORUS.

The following Sales Agencies will be pleased to supply any additional information that may be desired, viz:

Kellogg Weldless Tube Co.,
45 Milk Street, Boston.
Wm. J. Haines & Co.,
906 Filbert Street, Philadelphia.
Henry L. Coe,
727 Garfield Bldg., Cleveland.
Kellogg Weldless Tube Co.,
New York City.
M. T. Miles & Son,
317 and 318 Western Union Bldg., Chicago.
C. R. Talbot & Co.,
9 and 10 Wiggins Blk., Cincinnati.

THE BRASS FOUNDERS' SUPPLY CO.

FURNACES, FLASKS, FOUNDRY Supplies and Specialties.

Send for our Catalogue and look at the Ribbed Flask.

R. M. BARNETT. 20-34 Prospect St., NEWARK, N. J. J. S. MUNDY.

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

IMPROVED DUPLEX SYSTEM
- - - FOR - - -
BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,
26 CORTLANDT STREET, NEW YORK.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

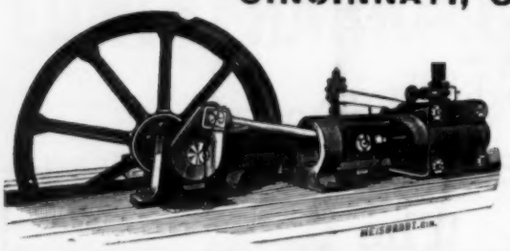
THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	* 5:45 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

THE LANE & BODLEY CO.,
CINCINNATI, OHIO.

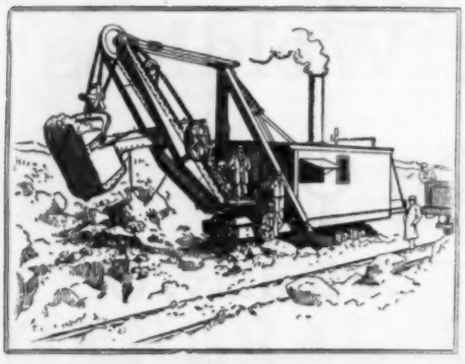


Engines,
ALL SIZES.
Simple and Compound.
Shafting, Hangers, Pulleys.
Belt Elevators, Saw Mills.

The Cleveland Terminal & Valley R. R. Co.

Depot foot of So. Water St. / City Office 137 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10A M
Akron, Canton & Valley	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.

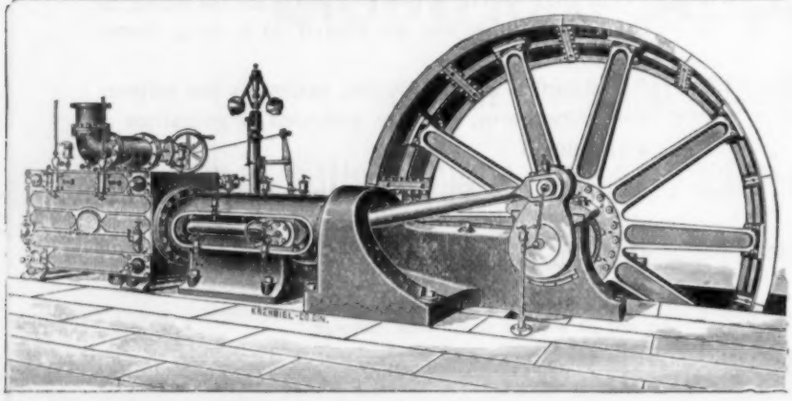


Bucyrus Steam Shovel & Dredge Co.

STEAM SHOVELS	Five sizes for every purpose. Standard Railroad Shovels. Special Shovels to order.
DREDGING MACHINES	More than 20 sizes in all types. Dipper, Elevator Hydraulic, to suit any requirements.
GOLD SAVING MACHINERY	For Placer Mining. With steam shovels and appliances for disposal of tailings.
WRECKING CRANES	Hand or Steam, 5 to 35 tons capacity. Also Locomotive Cranes and Pile-Drivers.
CENTRIFUGAL DREDGING PUMPS	6-inch to 36-inch. With either simple, compound or triple engines.

SOUTH MILWAUKEE, WIS.

THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O.



Hamilton Corliss Engines.

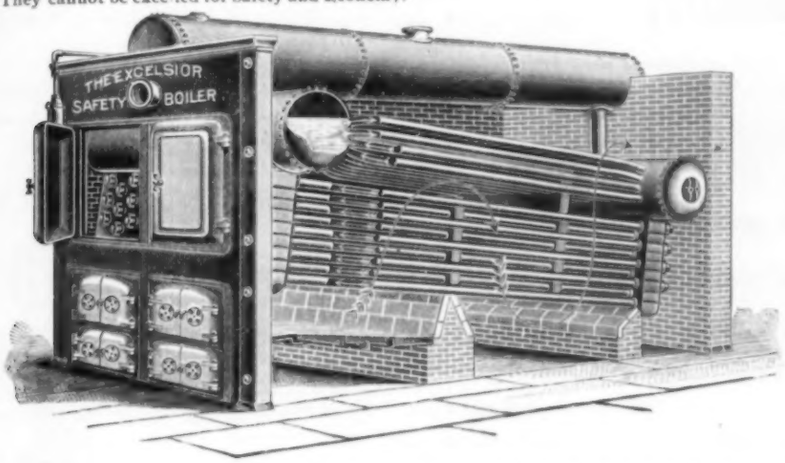
Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all Sizes and for all purposes.

46 South Canal St., CHICAGO.
39 and 41 Cortlandt St., NEW YORK.
Lewis Block, PITTSBURGH, PA.
Room A, Laclede Building, ST. LOUIS, MO.
C. C. MOORE & CO., SAN FRANCISCO, CAL.

EXCELSIOR SAFETY BOILERS.

In producing this boiler we have been governed by the three best elements in design—Simplicity, Accessibility and Strength. We have endeavored to make a boiler so simple that any Engineer or Fireman having ordinary knowledge of steam can understand and operate it. And at the same time should any part get out of order the man in charge can examine and repair it.
They cannot be excelled for Safety and Economy.



MEEHAN BOILER CO., - - - NEW CASTLE, PA.

THE CLONBROCK STEAM BOILER CO.,

BROOKLYN, N. Y.

MANUFACTURERS OF

THE MORRIN "CLIMAX" AND "COMPOUND" WATER TUBE BOILERS.

No Screw Joints. No Metallic Joints. No Ground Joints. No Packing Joints. No Cast Iron Pipes, Manifolds or Headers to cause trouble from Unequal Expansion or Contraction.

QUICK AND STEADY STEAMERS, POSITIVE CIRCULATION.

THE "CLIMAX" IS BUILT IN UNITS OF 50 TO 1000 H. P.
THE "COMPOUND" IS BUILT IN UNITS OF 50 TO 500 H. P.

Specifications, Blueprints, Etc., Furnished on Application.

SEND FOR "CLIMAX" and "COMPOUND" CATALOGUE.

WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., • Chicago and Niles, O.

CLEVELAND

.. GALVANIZING ..

WORKS.

Galvanizing in all its branches. Highest prices paid for new Scrap Zinc. When in the market for Pump Chains and Rubber Buckets write us for prices.

CLEVELAND, OHIO.

DIXON'S GRAPHITE PAINT

FOR TIN OR SHINGLE ROOFS AND IRON WORK. Tin roofs well painted have not required repainting for 10 to 15 years.
IT IS ABSOLUTELY WITHOUT AN EQUAL.

If you need any paint it will pay you to send for circular.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

NEW YORK TRIBUNE
1897.

Recognized as a Great, Safe, Clean, Family Paper—A Force in Public Affairs and Potent for Entertainment and Culture of Every Member of the Family.

A Colored Supplement With The Semi-Weekly.

There is a place in the United States for a weekly of really high intellectual quality, and the American people have given THE NEW YORK TRIBUNE a lavish welcome. During the past year THE WEEKLY was taken in over 245,000 families and read by about 1,250,000 people. Every effort will be made to brighten and enrich the paper and make it necessary to thousands of new friends.

Patriotic, self-respecting, enterprising, THE TRIBUNE is fearless and scholarly in editorial comment on public affairs, steadfast in principle, and not whirled about with every gust of passion; and it exhibits in every issue the truly American qualities of quickness, directness, brilliancy and force. It has won from Democratic rivals, by its thoroughly American spirit, the admission that it "commands the respect of all parties." In directing attention, early and pointedly, to the availability of McKinley and Hobart for the Republican nominations in 1896, THE TRIBUNE played a now well known and important part.

THE WEEKLY TRIBUNE ministers to all the sweet and wholesome interests of life; and it is distinctly a paper for families and for those who want the spirit and the editorials of the leading Republican paper of the United States. It has an excellent Agricultural page, a page of Science and Mechanics, a charming page especially for women, a strong array of market reports of unchallenged excellence, and book reviews, foreign letters, and bright miscellany, in addition to the news of the week. It can usually be subscribed for with local county weeklies. Sample copies free.

—

THE SEMI-WEEKLY is printed on Tuesday and Friday, and gives twice as much matter as the Weekly.

The craving for color on the part of the young, and even of other members of a family, has now been recognized by THE SEMI-WEEKLY TRIBUNE in the publication of a colored supplement of 16 pages, with each Friday's paper. If not gratified in a proper way, the liking for pictures and innocent bright reading matter, will incline many to seek in less desirable publications that which they cannot find in their favorite paper. The jokes and quaint paragraphs, and the 50 or more political cartoons, humorous sketches, and half-tones, and other amusing contents of the colored supplement will prove a welcome addition to the wiser and weightier parts of the paper. It is printed on superfine paper, and its 16 pages are themselves fully worth the price of the SEMI-WEEKLY. Sold separately, as a pictorial weekly, "Twinkles" readily brings 5 cents a copy and in the course of a year the reader would receive more than he has paid for the TRIBUNE itself. The piquant comicalities of the supplement will lend new value to bound volumes and make each copy valuable long after the date of publication.

This edition is not offered in combination with local weeklies. The colored supplement will be sent only to subscribers, who forward the regular price of the SEMI-WEEKLY, $2 a year, to THE TRIBUNE direct. Sample copies of Friday's SEMI-WEEKLY free.

—

DAILY, $8 a year. SUNDAY TRIBUNE, $2. SEMI-WEEKLY, $2. WEEKLY, $1. TRIBUNE ALMANAC for 1897, with full election returns, out in January, 25 cents a copy.

THE TRIBUNE, NEW YORK.

THE 1896 EDITION

OF THE

Iron and Steel Directory

The American Iron and Steel Association has just completed a thorough revision of its

DIRECTORY OF THE IRON AND STEEL WORKS OF THE UNITED STATES,

Bringing down to **Jan. 1, 1896,** a description of these works. There is also

COMPLETE DIRECTORY

to other industries which are large consumers of Iron and Steel. A new feature is a complete list of **MALLEABLE IRON WORKS.** There is also a list, brought down to 1896, of Plate and Sheet Mills and of Tin Plate Works in the United States. Making a complete Directory of

BLAST FURNACES,
ROLLING MILLS,
BESSEMER STEEL WORKS,
OPEN-HEARTH STEEL WORKS,
CRUCIBLE STEEL WORKS,
PLATE AND SHEET MILLS,
CUT-NAIL WORKS,
TINPLATE WORKS,
STAMPING WORKS,
FORGES AND BLOOMARIES,
WIRE-ROD AND WIRE MILLS,
WIRE-NAIL WORKS,
IRON AND STEEL BRIDGE-BUILDERS,
IRON AND STEEL SHIP-BUILDERS,
HORSE-NAIL WORKS,
LOCOMOTIVE WORKS,
MALLEABLE IRON WORKS,
CAST-IRON PIPE WORKS,
WROUGHT-IRON AND
WROUGHT-STEEL PIPE WORKS,
CAR-AXLE WORKS,
CAR-WHEEL WORKS, AND
CARBUILDERS
IN THE UNITED STATES.

A cloth bound volume of 350 pages, 32 pages more than in the directory of 1894. The price fixed by the American Iron and Steel Association is $6.

The volume can be had at the same price, postage prepaid from

THE IRON TRADE REVIEW,

1142 Monadnock Blk., CHICAGO. 27 Vincent Street, CLEVELAND.

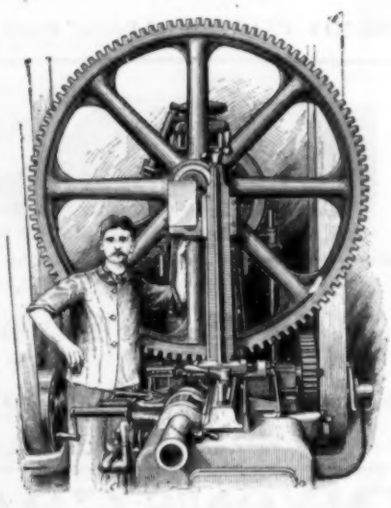
R. D. NUTTALL CO.,

99 BOQUET STREET, ALLEGHENY, PA.

THE SUPERIORITY OF

Cut Teeth Over Cast Teeth

IN GEARS FOR . . . .



Rolling Mill and Bridge Work

Have been fully demonstrated, both in the life of the Gear and greater efficiency.

CORRESPOND WITH US BEFORE ORDERING AGAIN.

JESSOP'S STEEL —FOR— **Tools, Drills, Dies, etc.**

Established over a Century ago. Manufactory, SHEFFIELD, ENGLAND.

CHIEF AMERICAN OFFICE, 91 JOHN ST., NEW YORK.

WM. JESSOP & SONS, Limited.

"Medal—World's Columbian Exposition, 1893."

All sizes carried in stock by The W. Bingham Co., Cleveland, Ohio.

NOTE THESE FACTS.

By the use of John Adt's Aut. Wire Straightening and Cutting Machines, Elastic Rotary Blow Riveting Machines and Tools, we have raised the standard of our work and increased our sales, for by their modern construction and time saving devices, the great production and good quality of work has enabled us to quote prices by which our customers would buy in large quantities.

Riveting Machine.

Others say they would have none other than John Adt's Machines and Tools. (This is the good news we are continually receiving.)

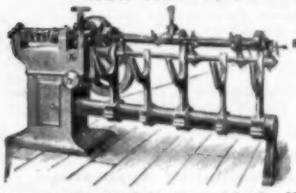
We also manufacture special Aut. Forming, Butt Mill, Drilling Machinery, Dies, Tools, etc., for the manufacture of Hardware, Bicycles, Saddlery and Sheet Metal Goods.

Estimates and advice as to manufacture of any articles furnished. Correspondence solicited. Give us a trial and be convinced.

JOHN ADT & SON,

F. B. SHUSTER, Prop.

New Haven, Conn.



Automatic Wire Straightening and Cutting Machine.

N. B. In addressing be sure and mention Dept. C.

ARE YOU LOOKING

FOR A CHANGE IN LOCATION?

If you are not satisfied with your present site, or if you are not doing quite as well as you would like to, why not consider the advantages of a location on the Illinois Central R. R. or the Yazoo & Mississippi Valley R. R.? These roads run through South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee Mississippi and Louisiana, and possess

FINE SITES FOR NEW MILLS,

BEST OF FREIGHT FACILITIES,

CLOSE PROXIMITY TO

COAL FIELDS AND DISTRIBUTING CENTERS

AND

INTELLIGENT HELP OF ALL KINDS,

MANY KINDS OF RAW MATERIAL.

For full information, write the undersigned for a copy of the pamphlet entitled

100 Cities and Towns WANTING INDUSTRIES

This will give you the population, city and county debt, death rate, assessed valuation of property, tax rate, annual shipments, raw materials, industries desired, etc.

To sound industries, which will bear investigation, substantial inducements will be given by many of the places on the lines of the Illinois Central R. R., which is the only road under one management running through from the North. Western States to the Gulf of Mexico. GEO. C. SCHOWER, Industrial Commissioner I. C. R. R. Co., 506 Central Station, Chicago. I-2-'94.

FOR SALE.

THE EAGLE FURNACE property, located at SPRING VALLEY, PIERCE COUNTY, WISCONSIN, on the Minnesota & Wisconsin Railway, which connects and has traffic arrangements with the Chicago, St. Paul, Minneapolis & Omaha Railway and the Wisconsin Central Railway, giving first-class shipping facilities. There is an inexhaustible supply of Brown Hematite Ores, running 45 to 50 per cent immediately accessible, at a cost of 2½ cents per Unit, delivered at the Furnace. Large quantities of Charcoal Wood can be secured at a low price in the immediate vicinity and also an abundance of good limestone. The iron product of this Furnace has an established reputation for Car Wheels, and Malleable and Structural purposes, so that the entire output can be sold without difficulty. A Modern Charcoal Blast Furnace 13x65, equipped with two 60 pipe Pollock Stoves, two Blowing Engines, of 15,000 cubic feet capacity at 40 revolutions, and with a known capacity of 70 tons per day. Also, all the tools, Barrows and appliances necessary for operation, in first-class order. There are 74 acres of land, on which are located several Tenement Houses, good Office and Office Furniture. This property will be sold to the highest Bidder, at Public Auction, on the 10th day of December 1896, at the hour of 12 M., at the front door of the Court House, in the village of Ellsworth, County of Pierce and State of Wisconsin. The upset price and terms will be named at the time of sale. Further particulars will be given by the undersigned upon inquiry.

D B. DEWEY,

Receiver and Master Commissioner,
No. 111 Monroe St., Chicago, Ill.

FOR
ARTISTIC
PRINTING
WRITE
THE
CLEVELAND
PRINTING &
PUBLISHING CO.,
CLEVELAND, O.

MECHANICAL ENGINEER.

Technical graduate and member of American Society, having 14 years' experience, including power plant and similar work, is open to engagement with manufacturing or engineering firm as manager, superintendent or other position of trust and responsibility. Unqualified references from East and West. Address

"L," Care Iron Trade Review,
Cleveland, Ohio.

S. FIX SONS'

STEAM TUBE WELDING WORKS.

Manufacturers of reworked boiler tubes
Good second-hand tubes bought.

CLEVELAND, O.

The Iron Trade Review is an increasingly valuable medium through which to sell equipment to machine shop and foundries.

THE BROWN HOISTING AND CONVEYING MACHINE CO. CLEVELAND, O.

MACHINERY FOR HANDLING COAL AND ORE.

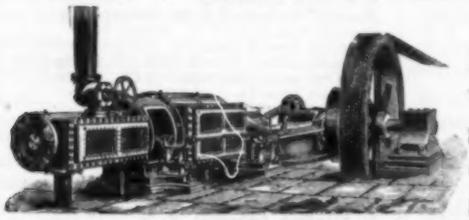
CRANES

NEW YORK, HAVEMEYER BLDG.
PITTSBURG, CARNEGIE BLDG.
CHICAGO, MARQUETTE BLDG.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

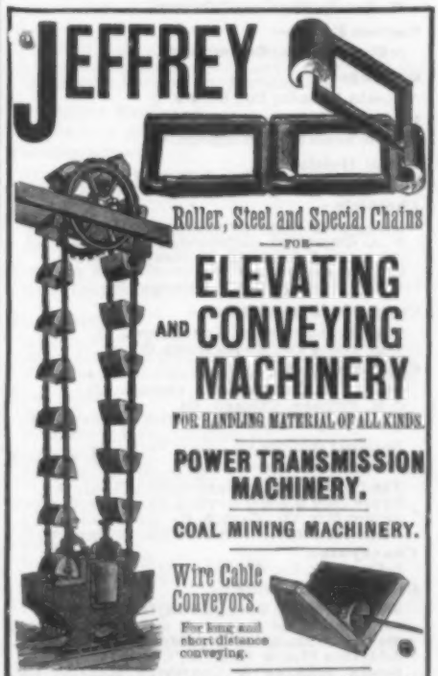
Williams Improved Vertical Engines

For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y.
E. F. WILLIAMS.

Park Building, Pittsburg,
SEWARD S. BABBITT.

JEFFREY



Roller, Steel and Special Chains

—FOR—

ELEVATING AND CONVEYING MACHINERY

FOR HANDLING MATERIAL OF ALL KINDS.

POWER TRANSMISSION MACHINERY.

COAL MINING MACHINERY.

Wire Cable Conveyors.

For long and short distance conveying.

THE JEFFREY MFG. CO.
Columbus, Ohio.

163 Washington St.
NEW YORK.

Send for Catalogue.

BUYERS' DIRECTORY OF IRON AND STEEL TRADES.

Air Compressors—
Rand Drill Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Analytical Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
Sharpless & Winchell, Minneapolis, Minn.
O. Textor, Cleveland, O
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.
Fessenden & Ridinger, Pittsburg, Pa.

Anti-Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, N. Y.

Babbitt Metal—
C. H. Besly & Co., Chicago, Ill.

Belting—
C. H. Besly & Co., Chicago, Ill.

Blacksmith and Carriage Supplies—
C. H. Besly & Co., Chicago, Ill.

Blowers—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston, Mass.

Blast Furnace Supplies—
Atwood & M'Caffrey, Pittsburg, Pa.

Boilers and Boiler Attachments—
Wm. B. Pollock & Co., Youngstown, O
S. Freeman & Sons Mfg. Co., Racine, Wis.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Fulton Steam Boiler Wks. & Fdy., Richmond Ind.
The Hazelton Boiler Co., New York.
The Stirling Co., Chicago, Ill.
Clonbrock Steam Boiler Co., Brooklyn, N. Y.
Harrison Safety Boiler Works, Philadelphia.
Lane & Bodley Co., Cincinnati, O.
Meehan Boiler Co., New Castle, Pa.
Almy Water Tube Boiler Co., Providence, R. I.

Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Boiler Fronts and Fittings—
Vulcan Iron Works Co., Toledo, O.
The Lane & Bodley Co., Cincinnati, O.

Boiler Tubes—
S. Fix Sons, Cleveland.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

Bolts and Nuts—
Upson Nut Co., Cleveland, O.

Boring and Turning Mills—
H. Bickford, Lakeport, N. H.

Brass Castings—
Nolte Brass Co., Springfield, O.

Brass Work (Special Finished)—
Nolte Brass Co., Springfield, O.

Bridges—
Berlin Iron Bridge Co., East Berlin, Conn.
Shiffler Bridge Co., Pittsburg.

Buildings (Steel Frame.)—
Berlin Iron Bridge Co., East Berlin, Conn.
Shiffler Bridge Co., Pittsburg.

Carbon Points—
Jeffrey Mfg. Co., Columbus, O.

Castings—
Lorain Foundry Co., Lorain, O.

Castings (Brass)—
Nolte Brass Co., Springfield, O.

Chain Hoists—
Moore Mfg. Co., Milwaukee, Wis.

Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
Sharpless & Winchell, Minneapolis, Minn.
O. Textor, Cleveland, O.
Robert W. Hunt & Co., Chicago, Ill.

Chilled and Sand Rolls—
The Lloyd-Booth Co., Youngstown, O.
Wm. Tod & Co., Youngstown, O.

Coal and Coke—
Forster, Waterbury & Co., Chicago, Ill.
C. K. Pittman, Chicago, Ill.

Core Compound—
National Jeloluse Co., New York City.

Corrugated Iron—
The Cincinnati Corrugating Co., Piqua, O.
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Conveyors—
Jeffrey Mfg. Co., Columbus, O.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
American Hoist & Derrick Co., St. Paul, Minn.
Marion Steam Shovel Co., Marion, O.
Addyston Pipe & Steel Co., Cincinnati, O.
Brown Hoisting & Conveying Machine Co., Cleveland, O.
Edwin Harrington, Son & Co., Philadelphia.
Phœnix Iron Works Co., Cleveland, O.
Moore Mfg. Co., Milwaukee, Wis.

Dies—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.

Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Drill Presses—
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Dry Kilns—
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston.

Dynamos—
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.
The Cincinnati Corrugating Co., Piqua, O.

Electrical Supplies—
Westinghouse Electric & Mfg. Co, Pittsburg
General Electric Co., Schenectady, N. Y.

Elevators—
The Lane & Bodley Co., Cincinnati, O.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Sterling Emery Wheel Mfg. Co., Tiffin, O.
Diamond Machine Co., Providence, R. I.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Sterling Emery Wheel Mfg. Co., Tiffin, O.
Diamond Machine Co., Providence, R. I.

Engineers and Contractors—
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.
Fessenden & Ridinger, Pittsburg, Pa,
Edward E. Erikson, Pittsburg, Pa.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
H. Channon Co., Chicago, Ill.
Jenkins Bros., New York City.

Engravers and Electrotypers—
Cleveland Electrotype Co., Cleveland, O.

Engines (Gas)—
Otto Gas Engine Works, Philadelphia, Pa.
The Prouty Co., Chicago, Ill.

Engine Packing—
C. H. Besly & Co., Chicago, Ill.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co,, Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Buffalo Forge Co., Buffalo, N. Y.
Lane & Bodley Co. Cincinnati, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.

Expansion Bolts—
Isaac Church, Toledo, O.

Factory Sites—
Chicago Heights Land Association, Chicago.

Fans—
Buffalo Forge Co., Buffalo N. Y.
B. F. Sturtevant Co., Boston, Mass.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Westmoreland Fire Brick Co., Pittsburg, Pa.
Reese, Hammond & Co., Bolivar, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Stowe, Fuller & Co., Cleveland, O.
Dover Fire Brick Co., Cleveland.
F. B. Stevens, Detroit, Mich
Stuart Fire Brick Co., Pittsburg, Pa.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Fire Protection—
Williams Mfg. Co., Kalamazoo, Mich.

Flasks—
Brass Founders' Supply Co., Newark, N. J.

Foot and Power Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati.

Foundries—
Taylor & Boggis Foundry Co., Cleveland, O.
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
The Rippel Mfg. Co., Mt. Gilead, O.
S. Freeman & Sons Mfg. Co Racine, Wis.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago.
East Chicago Foundry Co., Chicago.

Foundry Supplies—
Newport Sand Bank Co., Newport, Ky.
T. P. Kelley & Co., New York City.
Clearfield Fire Brick Co., Clearfield, Pa.
Stuart Fire Brick Co., Pittsburg, Pa.
F. B. Stevens, Detroit, Mich.
National Jeloluse Co., New York City.
Brass Founders' Supply Co., Newark, N. J.
Phœnix Iron Works Co., Cleveland, O.
The Ohio Sand Co., Conneaut, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.
American Smokeless Furnace Co., Cleveland, O

Furnaces—
Brightman Furnace Co., Cleveland, O.
American Smokeless Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.
American Fire Brick & Clay Co., Mineral Pt., O.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.
The Cincinnati Corrugating Co., Piqua, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
Taylor & Boggis Foundry Co., Cleveland, O.
Kurtz & Buhrer, Foundry Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee, Wis.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.

Heating and Ventilating Apparatus—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.
Berlin Iron Bridge Co., East Berlin, Conn.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Iron Ore, Bar and Pig Iron—
Oglebay, Norton & Co., Cleveland.
Condit-Fuller Co., Cleveland.
R. C. Pope, Cleveland.
Forster, Waterbury & Co., Chicago, Ill.
Central Iron & Steel Co., Brazil, Ind.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.
Cambria Iron Co., Johnstown, Pa.
Clinton Iron & Steel Co., Pittsburg.

Iron Shutters and Doors—
The Cincinnati Corrugating Co., Piqua, O.

Iron Working Tools—
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia
Dietz, Schumacher & Boye, Cincinnati, O.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY,

PITTSBURG, PA.

Manufacturers of Standard Systems for Electric Light and Power Distribution

IN CITIES, FACTORIES, MILLS AND MINES.

THE TESLA POLYPHASE ALTERNATING SYSTEM OF ELECTRICAL TRANSMISSION by which Power, Incandescentand Arc Lighting may be Supplied from the SAME CIRCUIT.

THE WESTINGHOUSE ELECTRIC RAILWAY SYSTEM,

WHICH IS THE MOST DURABLE, ECONOMICAL AND EFFICIENT ON THE MARKET.

NEW YORK, 120 Broadway.
BOSTON, Exchange Building.
BUFFALO, No. 8 Erie County Bank Bldg.
CHARLOTTE, N. C., 28-38 College St.
CHICAGO, New York Life Building
PHILADELPHIA, Girard Building.
PITTSBURG, Westinghouse Building.
ST. LOUIS, American Central Building.
SAN FRANCISCO, Mills Building.
SYRACUSE, N. Y., Bastable Building
TACOMA, WASH., 102 S. 10th St.

WESTINGHOUSE ELECTRIC COMPANY, LTD. 32 Victoria St., LONDON, S. W., ENGLAND. 32 Ave. de l'Opera, PARIS, FRANCE.

For Canada, address AHEARN & SOPER, OTTAWA, ONT.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co. Chicago, Ill.

Lathes—
Lodge & Shipley Machine Tool Co., Cincinn
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Diamond Machine Co., Providence, R. I.
Dietz, Schumacher & Boye, Cincinnati, O.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati.
Dietz, Schumacher & Boye, Cincinnati, O.

Machine Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Atwood & M'Caffrey, Pittsburg, Pa.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metallic Lath—
The Cincinnati Corrugating Co., Piqua, O.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.

Motors—
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.

Molding Sand—
Ohio Sand Co., Conneaut, O.
Newport Sand Bank Co., Newport, Ky.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.

Pattern Leather Fillet—
Canton Leather Fillet Co., Canton, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Phosphor Bronze Castings—
Nolte Brass Co., Springfield, O.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Planers—
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Polishing Machines—
Diamond Machine Co., Providence, R. I.

Portable Forges—
Buffalo Forge Co., Buffalo, N. Y.
Cady Mfg. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.

Pumps (Steam)—
Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Atwood & M'Caffrey, Pittsburg, Pa.
Henry R. Worthington, Brooklyn, N. Y.
Hughes Steam Pump Co., Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.
Uehling, Steinbart & Co., Ltd., Newark, N. J.

Radial Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Rock Drills—
Rand Drill Co., Chicago, Ill.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.

Rolling Mill Supplies—
Atwood & M'Caffrey, Pittsburg, Pa

Roofs—
Berlin Iron Bridge Co., East Berlin, Conn.
The Cincinnati Corrugating Co., Piqua, O.
Shiffler Bridge Co., Pittsburg.

Roofing Plates—
The Cincinnati Corrugating Co., Piqua, O.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Saws—
Peter Geriach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.

Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.

Semi-Steel—
McDowell Steel Co., Chicago, Ill.

Shafting—
Finished Steel Co. Youngstown, O.
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co. Piqua, O.
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Edwin Harrington Son & Co., Philadelphia.

Skylights—
Translucent Fabric Co., Quincy, Mass.

Stamping and Punching—
Cady Mfg. Co., Cleveland, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O
Marion Steam Shovel Co., Marion, O.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y

Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
McDowell Steel Co., Chicago, Ill.
The Sargent Co., Chicago, Ill.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Steel Shafting—
Finished Steel Co., Youngstown, O.

Steel Tanks—
Berlin Iron Bridge Co., East Berlin, Conn.

Stokers—
Playford Stoker Co., Cleveland, O.
American Smokeless Furnace Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.

Structural Engineers—
Berlin Iron Bridge Co., East Berlin, Conn.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Central Iron & Steel Co., Brazil, Ind.

Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.
Enterprise Boiler Co., Youngstown, O.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Atlanta Steel & Tin Plate Co., Atlanta, Ind.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
C. H. Besly & Co., Chicago, Ill.

Tube Welding—
S. Fix Sons, Cleveland.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston, Mass.

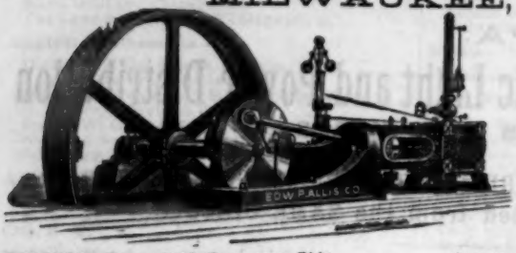
Water Tanks—
Williams Mfg. Co., Kalamazoo, Mich.

Wire Rope—
American Hoist & Derrick Co., St.

Wire Machinery—
Cady Mfg. Co., Cleveland, O.
John Adt & Son, New Haven Conn.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.

Reynolds Patent Vertical Boilers.

Reynolds Corliss Engines.

NEW YORK, Room 1111 Havemeyer Bldg.
CHICAGO, Room 509, Home Ins. Bldg
MINNEAPOLIS, Room 416, Corn Exchange.
DENVER, 1316 18th Street.
SAN FRANCISCO, 31 Main Street.
PITTSBURG, 702 German National Bank Bldg.
SALT LAKE CITY, Desert Bank Bldg.
KANSAS CITY, Armour Bldg.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Adt & Son, John	27
†Addyston Pipe & Steel Co.	—
Ætna-Standard Iron & Steel Co.	32
Aitchison, Rob't Perforated Metal Co.	31
Allis & Co., Edward P.	30
Allison Coupon Co.	33
Almy Water Tube Boiler Co.	21
Atwood & M'Caffrey	18
Bacon, Earle C.	19
Baird Machinery Co.	18
Battle Creek Steam Pump Co.	21
Berlin Iron Bridge Co.	32
Besly & Co., C. H.	36
Bethlehem Iron Co.	35
*Berger Mfg. Co.	2
*Bertsch & Co	1-22
Bickford, H.	36
Bourne-Fuller Co.	20
Brass Founders Supply Co.	24
Brightman Furnace Co.	36
Brown, Edward	35
Brown Hoisting & Conveying Machine Co.	27
Bucyrus Steam Shovel & Dredge Co.	24
Buffalo Forge Co.	1
Cady Mfg. Co.	31
Cahall Sales Department	1
Cambria Iron Co.	33
Central Iron & Steel Co.	35
Chicago Heights Land Ass'n.	23
†Chicago & Northwestern Ry.	—
Channon & Co., H.	36
Church, Isaac	35
Cincinnati Corrugating Co.	2
Clearfield Fire Brick Co.	35
Cleveland & Buffalo Transit Co.	20
Cleveland City Forge & Iron Co.	1
Cleveland Electrotype Co.	35
*Cleveland Galvanizing Works	25
Cleveland Rolling Mill Co.	35
Clinton Iron & Steel Co.	31
*Clonbrock Steam Boiler Co.	25
*C. M. & St. P. Ry.	34
Cole, J. Wendell	36
Deming Co.	21
Detroit & Cleveland Steam Navigation Co.	35
*Diamond Machine Co.	—
Dickman & MacKenzie	1
*Dietz, Schumacher & Boye	—
Dixon, Jos. Crucible Co.	25
Dover Fire Brick Co.	35
East Chicago Foundry Co.	17
Emmerton, F. A.	2
Erikson, Edward E.	17
Finished Steel Co.	19
*Fix Sons	27
Fleharty, J. H. & Co.	2
Forster, Waterbury & Co.	1
*Freeman & Sons, S.	20
Fessenden & Ridinger	2
*Fulton Steam Boiler Wks. & Fdy. Co.	20
General Electric Co.	33
Gerlach, Peter & Co.	30
Gobeille Pattern Co.	1
Harrington & King Perforating Co.	34
Harrington, Son & Co., Edwin	22
Harrison Safety Boiler Works	16
Hartford Steam Boiler Insp. & Ins. Co.	1
Hazelton Boiler Co.	20
Hooven, Owens & Rentschler Co.	24
Hughes Steam Pump Co.	21
Hunt & Co., Robert W.	2
Illinois Central R. R.	27
Illinois Screw Co.	1
Iron Clad Paint Co.	31
Jeffrey Mfg. Co.	27
Jenkins Bros.	19
Jessop & Sons, Ltd., Wm.	27
Jones Foundry Co., W. A.	1
Junction Iron & Steel Co.	2
Kellogg Weldless Tube Co.	23
†Kelly & Co.	—
Lane & Bodley	24
Lloyd Booth Co.	34
*Lodge & Shipley Machine Tool Co.	36
Lorain Foundry Co.	1
Marine Iron Works	19
Marion Steam Shovel Co.	35
McDowell Steel Co.	35
Meehan Boiler Co.	25
Moore Mfg. Co.	1
†National Jeloluse Co.	—
†Newport Sand Bank Co.	—
Nolte Brass Co.	36
Norman Co., J. J.	36
North American Metaline Co.	36
Nuttall Co. The R. D.	26
Oglebay, Norton & Co.	20
†Ohio Sand Co.	—
Otto Gas Engine Co.	31
†Phœnix Iron Works Co.	—
Pittman, C. K.	2
Pollock, Wm. B. & Co.	2
Playford Stoker Co.	2
Pope, R. C.	20
Prouty Co., The	2
Q. & C. Co	36
Rand Drill Co.	2
Rippel Mfg. Co.	1
Reese, Hammond & Co.	36
Rockwell & Co., W. S.	24
Sargent Co., The	17
‖Sharon Fire Brick Works	—
Sharpless & Winchell	36
Shiffler Bridge Co.	33
Southwark Foundry & Machine Co.	20
Sterling Emery Wheel Mfg. Co.	34
Stirling Co.	21
Stevens, F. B.	36
Stowe, Fuller & Co.	17
Stuart Fire Brick Co.	33
Sturtevant Co., B. F.	2
Sykes Iron Roofing Co.	25
Taylor & Boggis Foundry Co.	1
Textor, O.	2
Tod, Wm. & Co.	27
Toledo Machine & Tool Co.	35
Translucent Fabric Co.	32
Uehling, Steinbart & Co.	21
Union Mining Co.	17
Upson Nut Co.	1-2
Westinghouse Electric & Mfg. Co.	29
*Williams Mfg. Co.	—
Westmoreland Fire Brick Co.	31
Worthington, Henry R.	21
Wellman Seaver Engineering Co.	36

A growing circulation among machine shop and foundry firms, has

THE IRON TRADE REVIEW.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@4.75
No. 1 Bessemer hematite	4.00@4.25
Hematites No. 1 non-Bessemer	3.25@2.50
No 1. Specular, non-Bessemer	2.75@3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$12 25@12 50
No. 1 Strong Foundry	11 65@12 15
No. 2 Strong Foundry	11 25@11 40
No. 1 Gray Forge, red short	10 65@10 75
No. 2 Gray Forge, neutral	10 25
No. 1 American Scotch	12 25
No. 2 American Scotch	11 75
Lake Superior Charcoal	13 50
PITTSBURG:	
No. 1 Foundry	$12 00@12 25
No. 2 Foundry	11 25@11 50
Gray Forge	10 40@10 50
White and Mottled	10 00
Warm Blast Charcoal	15 00@16 00
Cold Blast Charcoal	20 00
Bessemer	12 00@12 25
CHICAGO:	
Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	11 75@12 25
Local Coke Foundry No. 2	11 25@11 75
Local Coke Foundry No. 3	11 00@11 25
Local Scotch Foundry No. 1	11 75@12 25
Local Scotch Foundry No. 2	11 25@11 75
Local Scotch Foundry No. 3	11 00@11 25
Southern Coke No. 1	12 15@12 65
Southern Coke No. 2	11 40@11 90
Southern Coke No. 3	10 90@11 40
Southern No. 1 Soft	11 65@12 15
Southern No. 2 Soft	11 15@11 40
Southern Silveries No. 1	12 15@12 65
Southern Silveries No. 2	11 65@12 15
Jackson Co. Silveries	14 00@16 05
Ohio Silveries No. 1	15 00@15 55
Ohio Silveries No. 2	14 50@15 05
Ohio Strong Softeners	14 00@14 28
Alabama Car Wheel	16 65@17 15
Malleable Bessemer	12 75@13 50
Coke Bessemer	13 00@13 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$10 75@11 00
Southern Coke No. 2 and No. 1 Soft	10 25@10 50
Hanging Rock Coke, No 1	12 50@13 50
Hanging Rock Charcoal No. 1, Fdy	15 00@16 00
Tennessee Charcoal No 1	13 00@14 00
Jackson County Silvery No 1	13 50@14 00
Southern Coke, Gray Forge	9 25
" " Mottled	9 25
Standard Alabama Car Wheel	14 75@15 50
Tennessee " "	13 50@14 50
Lake Superior " "	14 75@15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$...12 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 75
Ohio Strong Softener No. 1	12 25
Jackson Co. Silvery No. 1	15 25
Lake Superior Charcoal	13 50@14 50
Southern Soft No. 1	11 40
Hanging Rock Charcoal	17 00
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$...$11 50
Southern Coke No. 2	11 00
Southern Coke No. 3	10 50
Southern Gray Forge	10 25
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@14 00
Ohio Softeners	15 00
Lake Superior Car Wheel	15 25
Southern Car Wheel	15 25

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$15 00
Old steel rails	12 00
Old car wheels	12 50
	NET TONS
No. 1 R. R. wrought scrap	$12 50
Mill scrap	9 00
No. 1 Machine cast scrap	9 00
Iron axles	16 00
Axle turnings	8 00
Wrought turnings (free from cast)	7 50
Cast borings	6 00
Uncut wrought iron boilers	5 00
Steel boiler plates	9 00
Grate bars	6 00
Pipes and flues (clean)	8 50
Tank iron	8 50
Hoop and band iron	6 50
Sheet iron	5 00
Wrought drillings	7 00
Malleable iron	10 00

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.63c
Angles	1.25c
Tees	1.40c
Universal Plates	1.20@1.25c
Sheared Plates	1.30c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.20 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.20 "

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

18, 20 and 22 Johnson St., CLEVELAND, O.

SEND FOR OUR NEW CATALOGUE OF Power Presses, Drop Hammers, Punches and Shears, Wire Working and Special Machinery.

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

A. H. LEITCH, PREST. JOHN C. LEITCH, SEC. AND TREAS.

WESTMORELAND FIRE BRICK CO. MANUFACTURERS OF HIGH GRADE FIRE BRICKS

PITTSBURG, PA.

Works and Mines, Westmoreland, Pa.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

POWER From **GAS OR GASOLINE.**

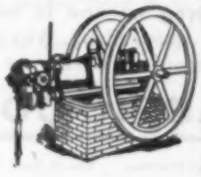
No Steam, Coal, Ash, Gauges, Engineer nor Danger.

From 1 to 250 horse-power. } **Can be Used in City or Country.**

THE OTTO GAS ENGINE WORKS, Inc.

33d and Walnut Sts., PHILADELPHIA, PA.

S. M. York, 42 S. Water St., Cleveland Agent. Over 45,000 Sold.



The "MONEY QUESTION" is what the financiers are worrying about but **GOOD FOUNDRY IRONS** is the question which interests the foundrymen.

CLINTON.

STOP THAT LOSS DUE TO BAD CASTINGS

BY USING

CLINTON AND HECTOR

Inspected Foundry Pig Irons

For Softness, Strength, Fluidity and Uniformity

HECTOR.

CLINTON IRON & STEEL CO.,

Furnaces: Pittsburg, Pa. New York Office, No. 15 Cortlandt Street.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7¾	2.50 extra.
¾ to ⅞	.10 "
⅞ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron

1½ to 4 x ⅜ to 1	1.20 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1½ to 4 x 1 1-16 to 1¼	.30 "
4¼ to 6 x 1 1-16 to 1¼	.40 "
6¼ to 8 x 1 1-16 to 1¼	.60 "
8¼ to 10 x 1 1-16 to 1¼	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.63 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅝ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
¾ to 15-16 x ⅜ to ⅝	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅝ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5 16 thick. **Bevel Edge shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos 10, 11 and 12	1.10 "
7-16 to ½ x No 9 to 3-16	1.30 "
7-16 to ½ x Nos 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅝ to 1⅛	.40 extra.
½ to 13-16	.50 "
⅜ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9 16 x 3-16	1.00 "
⅜ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
½ to 13-16	.70 "
⅜ to 11-16	.90 "
½ t 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c extra.

Cutting ordinary bars to specified length, 20 to 30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base.
		Extras.
1½ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3- 6"	.10 "
1 to 1¾,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or ¼"	.45 "
½,	Nos. 7, 8 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7. 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05 "

Iron and Steel Hoops.

Width In Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1 60 Base.
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 7-16 to 1¾,	" 22	.25 "
1 ⅛ to 1¾,	" 13, 14 and 15	.05 "
1⅛ to 1¾,	" 16, 17 and 18	.10 "

Soft Steel Bars, Light

LOW PRICES

do not always influence business. Some brands of goods are undesirable as a **Gift.**

Write us for our catalogue and send us a sample order and see if there is not **Economy** in using **First Quality** goods at Fair Prices.

Structural Shapes, Rails.

TIN PLATES,
GALVANIZED SHEETS,
CORRUGATED IRON,
BLACK PLATES,

Sheet Iron and Steel, any finish, patent leveled or common.

Aetna Standard Iron & Steel Co.,
BRIDGEPORT, OHIO.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

DO YOUR

SKYLIGHTS LEAK?

Then send for our catalogue. It will tell you how to repair them so they will never leak.

Translucent Fabric Skylights are now in use in all parts of the United States, and are giving the best satisfaction. Why? Because they never crack, break or leak, cost nothing for repair work and are inexpensive to build.

TRANSLUCENT FABRIC CO., QUINCY, MASS.

CHAS. M. JARVIS, Pres. and Chief Engineer. BURR K. FIELD, Vice President. GEO. H. SAGE, Sec'y. F. L. WILCOX, Treasurer.

THE Berlin Iron Bridge Co.

Engineers, Architects and Builders of Iron and Steel Structures.

The above illustration is taken direct from a photograph, and shows the interior of a Machine Shop designed and built by us for the Ball & Wood Co., at Elizabethport, N. J. The building is 80 feet in width by 180 feet in length. The central portion is 40 feet from center to center of traveling crane rails, while the two story wings on each side are 20 feet in width. We built the entire building, including the brick work and foundations, the whole complete ready for the machinery.

OFFICE AND WORKS:

EAST BERLIN, : : : : : : : : CONN.

1⅛ to 1⅜,	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	21	.20 "
1⅛ to 1⅜,	22	.30 "
15-16 and 1,	13, 14 and 15	.10 "
15-16 and 1	16, 17 and 18	.15 "
15-16 and 1,	19 and 20	.20 "
15-16 and 1,	21	.25 "
15-16 and 1,	22	.35 "
⅞,	Nos. 13, 14 and 15	.20 "
⅞,	16, 17 and 18	.25 "
⅞,	19 and 20	.30 "
⅞,	21	.35 "
⅞,	22	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	16, 17 and 18	.35 "
¾ and 13-16	19 and 20	.40 "
¾ and 13-16	21	.45 "
¾ and 13-16	22	.50 "
¾ and 13-16	23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	16, 17 and 18	.40 "
11-16,	19 and 20	.50 "
11-16,	21	.60 "
11-16,	22	.70 "
11-16,	23	.80 "
⅝,	Nos. 13 14 and 15	.40 "
⅝,	16, 17 and 18	.45 "
⅝,	19 and 20	.55 "
⅝,	21	.65 "
⅝,	22	.75 "
⅝,	23	.85 "
9-16,	13, 14 and 15	.45 "
9-16,	16, 17 and 18	.50 "
9-16,	19 and 20	.60 "
9-16,	21	.70 "
9-16,	22	.80 "
9-16,	23	.90 "
½,	13, 14 and 15	.55 "
½,	16, 17 and 18	.60 "
½,	19 and 20	.70 "
½,	21	.80 "
½,	22	.90 "
½,	23	1.00 "
7-16,	13, 14 and 15	.80 "
7-16,	16, 17 and 18	.90 "
7-16,	19 and 20	1.00 "
⅜,	13, 14 and 15	1.00 "
⅜,	16, 17 and 18	1.10 "
⅜,	19 and 20	1.20 "

Sheet Iron.

No. 10	1 65
No. 12	1 85
No. 14	1 75
No. 15-17	1 90
No. 18	2 00
No. 20	2 15
No. 22-24	2 25
No. 25-26	2 35
No. 27	2 45

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 55
Flange	1 65
Marine Flange	1 80
Fire Box	2 25

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1¼c. "
104 to 106 in. wide	special.

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts lbs.
1 to 2 in. inclusive	.08
9-16 to ⅞ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in	.09
3⅛ to 4 in	.09⅜
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in	.10½
¼ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black	base,	four 10s		62
Butt " "	"	four 10s		62½
Lap " galv.	"	four 10s		52½
Butt " "	"	four 10s		50
Boiler tubes 2¼" and smaller				70
Boiler tubes 2½" and larger				75
Casting screw and socket joint			dis.	52½
Casing inserted joint			dis.	47½

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
228 Lumber Exchange, Minneapolis, Minn.

CAMBRIA STEEL.

Steel Rails, Blooms, Billets, Beams, Bars, Axles, Angles, Channels, Castings, Forgings, Zee Bars, Car-Channels, Locomotive, Car and Structural Steels, etc.

CAMBRIA IRON COMPANY, S. W. Cor. 15th and Market Sts., opp. Penna. R. R. Station, Philadelphia; Chicago office, Western Union Building; New York office, (for Rails and Axles), 33 Wall St.; Cleveland office, Bourne, Fuller & Co; Detroit office, Newberry Bldg.; Toledo office, The Nasby, No. 401; Cincinnati office, cor. Elm and Pearl Sts. Works at Johnstown, Pa.

GAUTIER STEEL DEPARTMENT OF CAMBRIA IRON CO.,

JOHNSTOWN, PA.

MERCHANT BAR STEEL: Including Tire, Toe Calk, Machinery, Carriage Spring, Railroad Spring, Hoe, Rake, Fork, etc.
AGRICULTURAL STEEL AND SHAPES: Finger Bars, Knife Backs, Rake Teeth, Bundle Carrier Teeth, Tedder Forks and Springs, Spring Harrow Teeth, Harrow (Drag) Teeth, Seat Springs, etc.
PLOW STEEL: Flat and Finished Plow Shapes, Digger Blades, Slabs (Penn and Pernot), Hammered Lay, Rolled Lay, etc.

Cold Rolled Steel Shafting. **Steel Harrow Discs.** **Cambria Link Barb Wire.**

New York Office, 102 Chambers St. | Philadelphia Office, 611 Phila. Bourse. | Chicago Office, 209 Western Union Bldg. | Atlanta Office, 325 Decatur st.

STUART FIRE BRICK CO.

MANUFACTURERS OF
Silica Brick
For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.
Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

DO YOU RUN A STORE?

.... IF SO, OUR ....

COUPON BOOK SYSTEM

Is what you want, and will greatly facilitate your store business. The special merits of our system over the old pass book are: That it is labor saving in many ways. It reduces book keeping. It obviates loss in failure to charge. It is a check against mistakes in delivery. It keeps constantly before you the exact amount of credit given to each customer. It prevents customer over running his limit or credit. You will find it far superior to the check system or any other system yet devised. We furnish circular and (canceled) sample coupon book free of charge. Won't cost you anything to investigate.

ALLISON COUPON CO., INDIANAPOLIS, IND.

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths' { Hill's	dis 40
Blacksmiths' { Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1½"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 46 gr.	No. 54 to 150 gr.	Flour, F. F. C.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4½c	5½c	2½c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Grant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 50
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F.	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 60@70
Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	10c
" " " over 5 lbs	8c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3¼
Hexagon	15½	11½	8½	6	5¾	5¼	
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.

{ Car lots	$2.55
{ Less than car lots	2.65

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 50
Medart Pulleys.....dis 50
Split Wood Pulleys.....dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block.....dis 20

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35c
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

Wrenches.

Coe's genuine.....dis 4 and 10
Girard Standard.....dis 70&15
Agricultural.....dis 75&15
Mechanic's.....dis 55&10& 0
Bemis & Call's Combination.....dis 30
Donohue's Engineers.....dis 20&15
Lamson & Sessions Engineers.....dis 65
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 40

LOCATIONS FOR INDUSTRIES.

The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

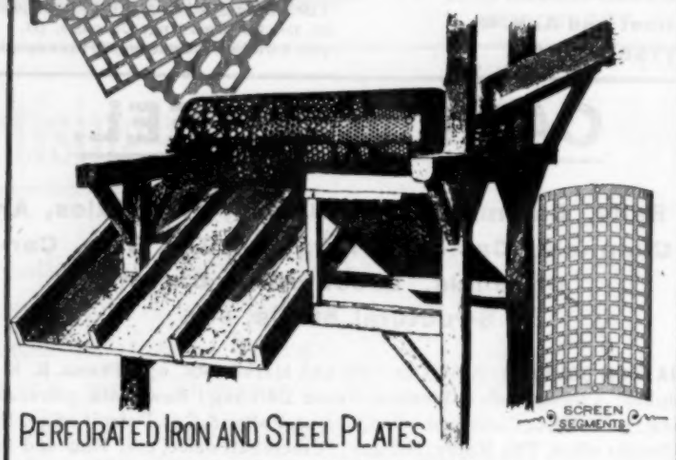
The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,154 miles (9,900 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity.

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address **LUIS JACKSON,**
Industrial Commissioner, C., M. & St. P. R'y.
425 Old Colony Bldg., CHICAGO, ILL.

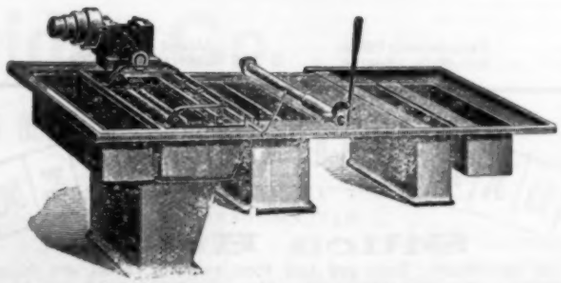
THE HARRINGTON AND KING PERFORATING CO.
CHICAGO, ILL.



PERFORATED IRON AND STEEL PLATES
FOR SCREENING AND SIZING
COAL, COKE, ORE, STONE &C.
BRONZE PLATES TO WITHSTAND THE ACTION OF MINE WATERS.
PLATES FURNISHED FLAT, OR ROLLED TO CYLINDRICAL FORM FOR REVOLVING SCREENS.
PERFORATIONS IN ROUND, SQUARE, OR OBLONG HOLES.
WE DO NOT FURNISH SCREENS COMPLETE ONLY PERFORATED SCREEN PLATES.

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY



Rolling Mills, Sand and Chill ROLLS.

STERLING EMERY WHEEL MFG. CO.
TIFFIN, O.

CORRESPONDENCE SOLICITED.
AGENTS:
Chicago Branch, 59 So. Canal St.
The Geo. Worthington Co., Cleveland.
Somers, Fitler & Clarke, Pittsburg

The COAST LINE to MACKINAC

TAKE THE

D & C

TO MACKINAC DETROIT PETOSKEY CHICAGO

2 New Steel Passenger Steamers

The Greatest Perfection yet attained in Boat Construction—Luxurious Equipment, Artistic Furnishing, Decoration and Efficient Service, insuring the highest degree of

COMFORT, SPEED AND SAFETY.

FOUR TRIPS PER WEEK BETWEEN

Toledo, Detroit & Mackinac

PETOSKEY, "THE SOO," MARQUETTE, AND DULUTH.

LOW RATES to Picturesque Mackinac and Return, including Meals and Berths. From Cleveland, $18; from Toledo, $15; from Detroit, $13.80.

EVERY EVENING

Between Detroit and Cleveland

Connecting at Cleveland with Earliest Trains for all points East, South and Southwest and at Detroit for all points North and Northwest.

Sunday Trips June, July, August and September Only.

EVERY DAY BETWEEN

Cleveland, Put-in-Bay & Toledo

Send for Illustrated Pamphlet. Address

A. A. SCHANTZ, G. P. A., DETROIT, MICH.

The Detroit and Cleveland Steam Nav. Co.

CLEVELAND ELECTROTYPE CO.

ELECTROTYPING ENGRAVING AND STEREOTYPING.

50 HIGH ST. — TEL. 2139.

PYROMETERS

Edward Brown,

ESTABLISHED 1860.

311 WALNUT St., PHILADELPHIA.

Manufacturer and Patentee OF THE

Hot Blast (or Graphite) Pyrometer.—The only stationary Pyrometer now in use durable over 700 degrees.

The Standard Portable Pyrometer—For Blast Furnaces.

Mercury Revolution Indicator.—Centennial Exhibition Medal. Accurate for all time.

Annealing Oven Pyrometer—to 3,000 degrees—of 1893.

Tin-plating Pyrometer—of 1894.

Mercury and Steam Gauges.

EXPANSION BOLTS.

For Fastening all Kinds of Structure to Brick and Stone Work.

Patentee and M'f'r, ISAAC CHURCH,

Send for Catalogue. 1521 Walnut St., TOLEDO, O

Semi-Steel Castings

34,000 TO 38,000 TENSILE STRENGTH.

Process Owned by

THE McDOWELL STEEL CO.,

Room 902, Mallers Bldg., - - CHICAGO, ILL.

THE BETHLEHEM IRON CO.,

Principal Office and Works'

SOUTH BETHLEHEM, PA.

STEEL RAILS.

BILLETS AND MUCK BAR,

STEEL FORGINGS.

HOLLOW SHAFTING, CRANKS, ROLLS, GUNS AND ARMOR.

Rough, Machined or Finished, Fluid Compressed, Hydraulic Forged.

NEW YORK OFFICE, 100 BROADWAY. PHILADELPHIA OFFICE, 421 CHESTNUT ST.

CHICAGO OFFICE, MARQUETTE BUILDING.

No. 34 Power Press

TOLEDO MACHINE & TOOL CO.,

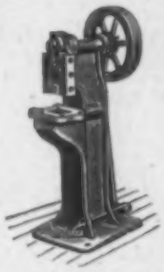
501-505 Superior St., Toledo Ohio.

We manufacture

Power Punches. Forging Presses.
Power Presses. Trimming Presses.
Straight Sided Double Pitman Presses.
Drop Presses.
Embossing Presses. Automatic Feed Presses.
Stamping Presses. Power Slitting Machines.
Riveting Machines. Power Shears.

Special and Automatic Machinery Dies for all classes of work in sheet metals.

Write for catalogue and prices.



No. 31 Power Press.

THE "CLEARFIELD" FIRE BRICK

MANUFACTURED BY

THE CLEARFIELD FIRE BRICK CO., Limited,

Office and Works at CLEARFIELD, PA.

920 Liberty Street, Pittsburg, Pa., John Richardson, Agent.

CLEVELAND ROLLING MILL CO.,

CLEVELAND, - OHIO,

—MANUFACTURERS OF—

BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.

KING'S SIX TON ELECTRIC CRANE

Can be furnished at low cost.

Write for full information to the MARION STEAM SHOVEL CO Marion, Ohio.

FIRE DOVER FIRE BRICK CO., BRICK

MANUFACTURERS OF

Furnace, Mill and Special Shape Fire Brick.

Office, 44 Mercantile Bank Bldg., CLEVELAND, OHIO.

The Iron Trade Review

Pays special attention to iron ore blast furnace, rolling mill, foundry and machine shop interests. Per year $3.00.

THE CENTRAL IRON & STEEL CO.

BRAZIL, INDIANA,

MANUFACTURERS OF

Wrought Iron Open Hexagonal Turnbuckles,

MADE FROM THE BEST CHARCOAL IRON.

Guaranteed Stronger than any Similar Article on the Market.

THE HART OR DETROIT

Emery Corundum Wheels and Machinery.

Write to J. WENDELL COLE, M. E.,

District Manager, Room 10, 221 Fifth Ave., Chicago, Ill., or Box 84, Columbus, O.

☞ N. B.—Also Agent of WM. SELLERS & CO.'S SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

The Wellman Seaver Engineering Co.

CONSULTING AND CONTRACTING ENGINEERS.

New England Bldg., Cleveland, Ohio.

Steel Works, Rolling Mills, Metallurgical Furnaces, Manufacturing Buildings, Machinery for the most economical handling of all kinds of materials.

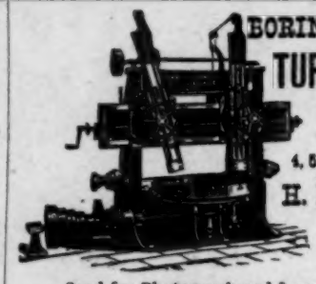
Fred. F. Sharpless. - Horace V. Winchell.

SHARPLESS & WINCHELL,

809 and 811 Wright Block, MINNEAPOLIS, MINN.

Analytical Chemists and Assayers. Consulting Geologists and Mining Experts

Mines examined. Advice given on treatment of ores and development of properties. Intimate acquaintance with Lake Superior Mineral Regions.



BORING AND TURNING MILLS.

4, 5 & 6 Ft. Swing.

H. Bickford, Lakeport, N. H

Send for Photograph and Low Price.

OILLESS BEARINGS

For Loose Pulleys and other bearings. Perfectly clean. No cutting or danger of fire from overheating. Send for Loose Pulley circular.

No. American Metaline Co.

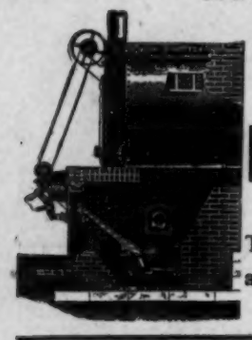
40 to 48 Third Street, Long Island City, N. Y.

F. B. Stevens

90 Griswold St., Detroit, Mich.

Fire Brick, Fire Clay and Foundry Supplies.

N. W. TAYLOR. H. H. CAMPBELL.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

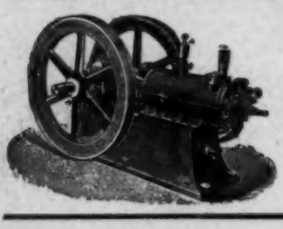
Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."



THE CHICAGO GAS and GASOLINE ENGINE

The simplest gas and gasoline engine on the market. Has no equal for absolute, steady speed and durability. It is a dwarf in size and a Samson in strength.

Catalogue sent on application.

MANUFACTURED BY

J. J. NORMAN CO., 60 S. Clinton St., Chicago, Ill.

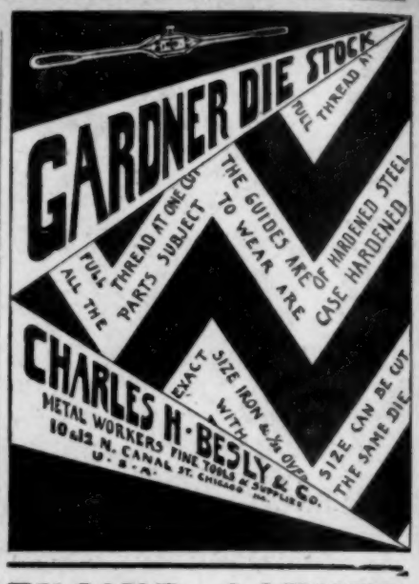
MODERN MACHINERY.

Issued Monthly in the interests of Machinists, Civil and Mechanical Engineers, and All Lines of Industry and Enterprise in which Machinery is Employed.

One Dollar Per Year. Sample Copy Free.

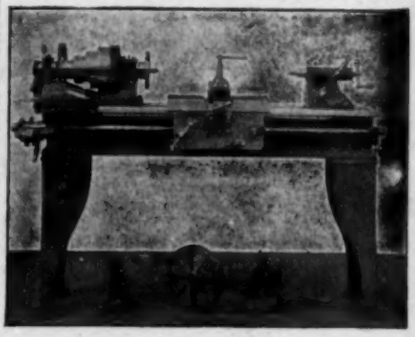
MODERN MACHINERY PUBLISHING CO.,

Ashland Block. CHICAGO.


GARDNER DIE STOCK
FULL THREAD AT ONE CUT
THE GUIDES ARE OF HARDENED STEEL
TO WEAR ARE CASE HARDENED
FULL THREAD ON ALL THE PARTS SUBJECT
EXACT SIZE IRON 4 3/4 OVER
SIZE CAN BE CUT WITH THE SAME DIE
CHARLES H. BESLY & CO.
METAL WORKERS FINE TOOLS & SUPPLIES
10 & 12 N. CANAL ST. CHICAGO U. S. A.

ENGINE LATHES.

14" to 42" SWING.



THE LODGE & SHIPLEY M. T. CO.

Culvert & Harrison Streets,

CINCINNATI, O.

BRASS CASTINGS

for all purposes. PHOSPHOR BRONZE for Machine Box Bearings, etc. Special Finished Brass Work made to order.

NOLTE BRASS COMPANY,

65 and 67 E. Washington St., Springfield, Ohio.

WIRE NAIL MACHINES

We are equipped to furnish the "Stephens" Wire Nail Machines on short notice. Best construction, largest capacity, smallest repairs.

FOREST CITY MANUFACTURING CO.,

No. 193 Merwin St., CLEVELAND, O.

"HAMMOND" AND "ACME"

HIGH GRADE **FIRE BRICK**

ARE THE BEST.

MANUFACTURED BY

Reese, Hammond & Co.,

BOLIVAR, PA.

Specialties: Tile, Grate Settings, Stove Linings and Difficult Shapes to order, Cupola Blocks.